

August 22, 1960

Aviation Week and Space Technology

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Silastic is flexible and rubbery at -130°F and does not harden and crack when exposed to heat. This permits efficient and long lasting seals that stay in place . . . keep cold air leakage and heat loss to a minimum . . . maintenance to detect and repair leaks is not required.

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- Sept. 14—Re presenta-
tions by Raytheon and Solec
Inte-
grated Systems, Society of Instru-
mented Technology and Smart Inte-
grated
tivity Society, London, England

Sept. 14—Carlsbad, Calif. Coast Computer
Expo

Sept. 14—16—Farnborough Flight Display
and Evolution, Farnborough, Eng-
land

Accred Construction, Farnborough, Eng-

Sept. 14—Joint Automatic Control Confer-
ence, Massachusetts Institute of Tech-
nology, Cambridge, Mass.

Sept. 14—16—Flight Control and Oper-
ations Symposium, American Corp., McAllen, Tex.

Sept. 14—16—1980 National Convention,
UK's Club of America, Texas Hotel,
Dallas, Tex.

Sept. 15—18—South Texas Methane
Gas Conference, New York, U.S.A.

Sept. 15—16—1980 Annual Meeting, College of Engineers, Dallas, Tex.

Sept. 15—16—1980 Annual Convex Meeting,
IAEA, Copenhagen, Denmark

Sept. 15—18—Second International Congress
of the International Council of the Economics
Sciences, Zurich, Switzerland

Sept. 15—16—1980 Annual USAF Safety Con-
ference, Wright-Patterson Air Force Base, Ohio

Sept. 15—16—1980 Annual Cold Environ-
ment Research Conference, Office of the Defense Inspector Gen-
eral for Safety USAF, Norton AFB, Calif.

Sept. 15—16—Annual Meeting, National
Assn. of State Auditors, Official Wins-
low Hotel, Atlanta, Ga.

Sept. 15—16—Annual Meeting, American
Forest Chemical Assn., Sherman Park
Hotel, Washington D.C.

Sept. 15—16—Flight Safety Foundation
Management Conference, Milwaukee, Wis.

Sept. 15—16—1980 National Symposium on Space
Communication and Telemetry, Institute of
Radio Engineers, Sheraton Hotel, Wash-
ington, D.C.

(Continued on next page)



AEROSPACE
COMPONENTS
BY LAVELLE

**AEROSPACE
COMPONENTS
BY LAVELLE**

Sheet metal wall thickness is controlled at the outer surface of an aluminum alloy nose cone by stiffener to precision set on a boring mill at Lavelle. Part of the RWT Series re-entry vehicle structure, recovered after full ICBM range flight, the stiffened cone is typical of methods used by Lavelle to meet the varied requirements of the aerospace industry.

Showcasing between the noise control structures above is a part of the Hawk missile system, a radar pedestal base magnesium weldment partially machined after assembly. Levelite works with a wide range of metals and alloys to produce sheet metal components for missiles, electronic spacers and ground support equipment to exacting specifications. Major companies rely on Levelite for precision components required in missiles, space vehicles, jet engines and aircraft.

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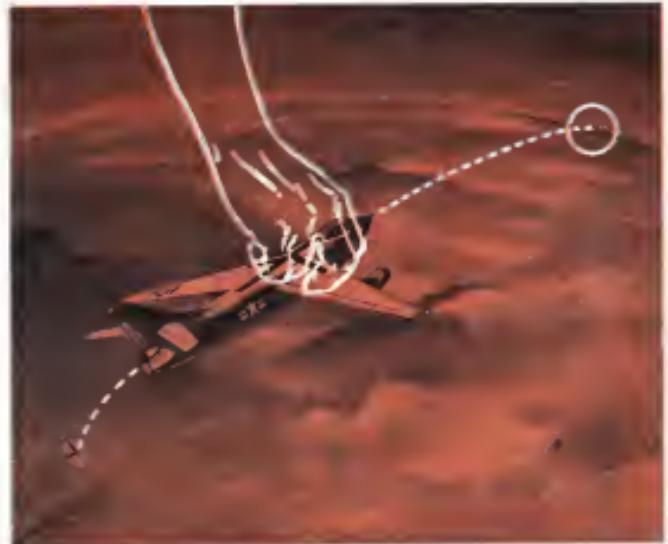
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- Accurate at any speed
- Low altitude reliability



AVIATION CALENDAR

(Continued from page 5)

- Sept. 20-21-24th Annual Meeting & Forum, National Research Institute Assn., Ambassador Hotel, Los Angeles, Calif.
- Sept. 23-25-National Convention and Aerospace Fair, Phoenix, Ariz. Phoenix Assn., Civic Auditorium and Brailsford Hall, Sun City, Arizona, Calif.
- Sept. 24-25-Los Angeles, Calif. Air Commando Group concurrent with AFAC Convocation.
- Coastal: Lt. Col. R. E. Main, USAF, 7021 Heywoodhurst Ave., Van Nuys, Calif.
- Sept. 25-27-24th Annual Convention, International Northwest Aviation Council, Portland, Oregon, Spectra Books, Columbia.
- Sept. 27-High-Speed Power Systems Conference, American Rocket Society, American Royal, Santa Monica, Calif.
- Oct. 2-13-Polytechnic Association, Inter-nationally Award Meeting, Pasadena.
- Oct. 3-Weekend National Convocation, American Institute of Radio Engineers, Utica, N.Y.
- Oct. 3-5-Seventh Annual Meeting, Institute of Radio Engineers' Professional Group on Nuclear Science, Gettysburg, Penn. Convener: Gen. Edgardo Melchor, Los Angeles.
- Oct. 3-8-National Midwinter Conference on Air Logistics, Institute of the Armed Services, Dallas, Okla.
- Oct. 3-10-International Air Traffic Control Conference and Folk Art Show, Meeting of the Assn. of Travel Counselors, Sheraton Palace Hotel, San Francisco.
- Oct. 4-6-Sixth Conference on Radar, Institute Radarstat, Chicago, Ill. Sponsor: American Research Foundation, U.S. Army, U.S. Navy, USAF, Institute of Radio Engineers Professional Group on Radar, Los Angeles.
- Oct. 5-7-Breeding Seminar on Dopplerometers in Space Age Technology, American Management Assn., Hotel Astor, New York, N.Y.
- Oct. 6-7-Annual Convocation, Annual Picnic and Fall Festival, Denver, Colo.
- Oct. 6-8-Society of Experimental Test Pilot Symposium on "Close-In" Flight, Ambassador Hotel, Los Angeles, Calif. Fourth Annual Annual Banquet, Oct. 8.
- Oct. 8-9-Annual Meeting, National Pilots Assn., Northern Hills Lodge, Wyoming.
- Oct. 8-10-Third Annual National Auto Club Foothills Fly-in, Michigan vs. Duke, Ann Arbor, Mich.
- Oct. 10-11-1963 National Electronic Components and Subsystems, Hotel Sherman, Chicago, Ill.
- Oct. 11-18-Society of Automotive Engineers National Automobile Meeting, Ambassador Hotel, Los Angeles, Calif.
- Oct. 14-15-Symposium on High-Speed Photography, Society of Photographic Scientists and Engineers, Washington, D.C.
- Oct. 17-18-1963 Meeting, Institute of the Astronautical Sciences and Canadian Astronautical Institute, Queen Elizabeth Hotel, Montreal, Canada.
- Oct. 19-21-Annual Convocation, Southeastern Airport Managers Assn., Fox Hollow Inn and Seminars, Bradenton, Fla.
- Oct. 19-21-1963 Annual Space Congress, Institute of Radio Engineers, Deaderick Hotel, Columbus, Ohio.



SILENT PARTNER

from take-off to target to bomb-drop and return

The new aboard a Navy Douglas Skywarrior bomber has been relieved of many exacting, exhausting tasks by the AN/ASB-7 all-weather navigation and bomb director system. Norden is serving as the systems manager for the ASB-7, whose sub-systems provide every function required. Doppler type radar gives speed data. An accurate dead reckoning system provides course, direction and position. Stabilization is provided by a Norden three-gyro platform. Search radar reveals targets, in all weather, at all distances within radar range and an optional system provides a direct view of ground and target. Finally, comput-

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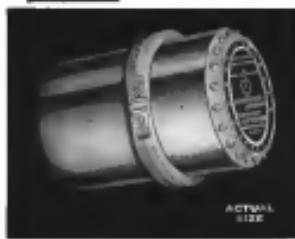
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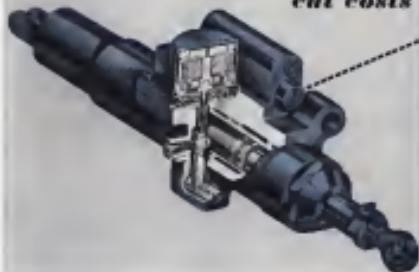
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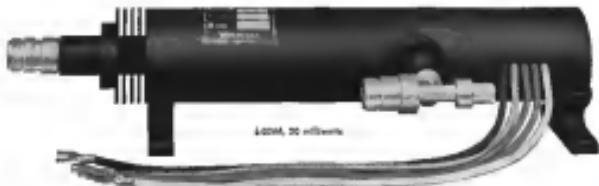
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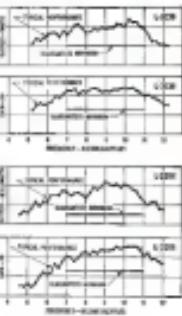
Small size (less than 12" in length), light weight (under 4 pounds each), and extreme environmental capability (temperature compensated -50°C to 80°C) make these tubes the ideal choice for many applications.

A typical airborne equipment, designed and manufactured by Granger Associates of Palo Alto, California, incorporates the L-3226 and L-3236 and occupies only 0.73 cubic feet, including all necessary power supply, modulating circuitry, cooling, etc. This equipment is now in field operation.

If your work involves ECM receivers, radar target enhancement, frequency diversity radar or any application requiring broadband microwave amplifiers, explore these new tubes. In production quantities their price is the lowest in the field. Ask for forming sheets on the L-3226 and L-3236. Address: Litton Industries Electron Tube Division, 950 Industrial Road, San Carlos, California.

(See item #103000)

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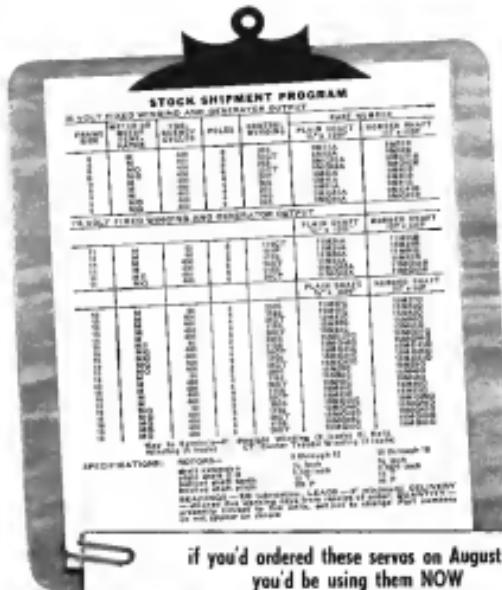
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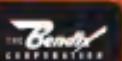
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Beneath the wings of its B-52 intercontinental bombers SAC now packs a formidable new weapon—the GAM-77 HOUND DOG air-to-surface missile. This first operational unit to carry the appearance weapon now is the 4335th Strategic Wing, based at Eglin Air Force Base, Florida.

This B-52/GAM-77 union greatly extends the useful life and striking power of SAC's long range bombers and adds to the command's operational flexibility.

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THE MISSILE DIVISION OF NORTH AMERICAN AVIATION, INC.

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5000 lb high vacuum induction furnace at Metals Division.

What's up...and where?

Philco airborne radar for ALRI extends the vision of SAGE

ALRI, the Airborne Long Range Input system of the U.S. Air Force, is the seaward extension of SAGE, the vast electronic network that warns of aircraft approaching the North American continent. Philco will develop, produce and modify the airborne height-finding radar as an ALRI team member under the system manager, Burroughs Corporation. Philco was selected for this vital work because of its long and extensive experience in the development and production of military airborne radar and its major contributions to radar technology. Here is further evidence of Philco's leadership in advanced electronics — for reconnaissance, communications, weapon systems, space exploration and data processing.

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EDITORIAL

New Partnership Needed

The initial success of the Tiros weather reconnaissance satellite and the Echo passive communication satellite provide solid evidence that the era of peaceful use of space for civilian purposes is already here upon us. In advance of the timetable envisioned by the most optimistic space prophets and much to the astonishment of the more cynical government officials who only a few short years ago viewed at satellites as a meaningless "baseball game in outer space."

Indeed, over this country's technical resources were even loosely applied to the task, the speed with which the varied exploratory phases of space technology have passed and thrust so hard against the necessity of organizing this exponential data into useful systems has been truly astonishing. Despite the heavy emphasis on the early and amateurish experimental failures in space exploration, genuine progress has actually occurred at a pace that leaves both the observer and the technicians working in the field truly astonished.

Two weeks ago (AW Aug. 8, p. 21) we suggested that the proper technical foundation had already been laid for a real global communications system and that thermal and international prestige as well as permanent industrial wealth would accrue to the nation that was the first to organize and operate such a system and present its benefits to the rest of the world. We also noted that the organization of our current military and civil space exploration programs had been thoroughly outstripped by this technical progress, and fundamental changes in the relationship between the government and private industry would be required to achieve maximum progress in making useful civil space system goals an attainable reality.

Industry Initiative

A useful beginning in exploring the relationships this new problem may require can be found in the lecture on "Competitive Private Enterprise in Space" delivered last May at the University of California by Ralph J. Cordiner, General Electric Co. board chairman. Mr. Cordiner may have sounded truly in jest in his lecture last May, suggesting commercial enterprises in outer space, but events of the past three months have led a solid foundation of technical fact under his theory. In addition to the American Telephone & Telegraph Co. proposal for a global communications network (AW Aug. 8, p. 21 and AW July 15, p. 17) Hughes Aircraft with its own funds is fitting themselves as an extremely lightweight communications satellite, with voice and television channel capability, designed to fit the Soviet booster which could be operational in within a year. This proposal has already been submitted to NASA. Mr. Cordiner's company, General Electric, also with private funds, has recently completed witness designs of a global communications system on which hardware construction could begin almost immediately.

It is painfully obvious that space again technology has outstripped expansion and the current pattern of military and civil space technology delivery cannot handle

the new problems created by a satellite communications system and other similar ventures. What is needed is a basically new partnership between the government and private industry, to get on with these jobs in a manner that will utilize the best capabilities of industry to achieve what are also highly desirable national goals.

It is obvious that government must be a key participant in these ventures for a variety of reasons both technical and political. Virtually all boosters and launching sites are government facilities and would have to be used in any commercial or joint venture. The problems of apogee, orbit and frequencies are also a proper area for government regulation. At present there is no government authority to grapple with any of these problems, although the National Aeronautics and Space Administration has begun studying them. We expect the extremely active House Science and Astronautics Committee also will explore the subject soon.

Historical Precedents

There are some historical precedents in the patterns by which government and industry have formed various types of partnerships to take a basic new technology through its early pioneering phase so that the foundations for eventual unbridled commercial utilization can emerge at no further cost to the taxpayer. An important example of one pattern whereby government and industry joined in the joint financing of the difficult pioneering phase of what has now become a tremendous national and international asset and a subsidy-free except in its newer and still technically evolving areas, such as longdistance and helicopter services.

The civil use of atomic energy has been another example with another type of government-industry partnership arrangement. If this type of joint effort had not been organized by the government early in the atomic age regardless of the immediate economic competitive aspects of nuclear energy as a power source, we would have made little progress toward the development of commercially feasible nuclear power systems and lag tremendously behind Britain and the Soviet Union in this vital area.

Mr. Cordiner touched on some of the thorny problems that will confront any effort to organize a workable government-industry partnership for initial operation of space systems, among them the current NASA patent restrictions, anti-trust restrictions and industry-caused space accidents which could postpone damage limitation for private insurance coverage. Basically, he feels the most helpful immediate action that could be forthcoming would be a firm statement of intent by both the executive and legislative branches of the government that space is not envisaged as a permanent government monopoly and that efforts will be made to determine and define a proper role for private industry as early as possible in the infancy of this incalculable new area of space technology.

—Robert Holt

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WHO'S WHERE

In the Front Office

Douglas A. Knobell, a director of Continental Airlines, has Mr. Knobell as president of Avco's General Corp.

John Lewis Collier, a director of General Motors Electronics Corp., Bethesda, Md. N. Y. M. Collier is chairman of the executive committee of B. F. Goodrich's board of directors.

Edith S. Green, a director of United-Carinish Corp., Boston, Mass. Ms. Green is vice-president of Bell Telephone Laboratories.

James Wood, vice-president and general manager, Rolls-Royce of Canada Ltd., Montreal, Canada, succeeding E. M. Kendall who is returning to England to take a senior position with Rolls-Royce, Ltd. Alan Broadbent, executive vice-president and deputy general manager, A. F. Heinkel, vice-president and secretary-treasurer.

N. D. Shandwick, vice-president in charge of British Aerospace Co.'s newly formed corporate division, Office of International Operations, Stevenage.

William H. Fahey, division vice-president operations planning, Radio Corporation of America's Semiconductor and Materials Division, Somerville, N. J.

August A. Dahlquist, vice-president in charge of CII Electronics Inc., a subsidiary of General Electric Corp., Gardner City, N. Y.

Eric E. Conner, vice-president finance, Esso Corp. Gasoline, Newark.

M. E. Gleason, a vice-president of Douglas Aircraft Co., will assume its General Manager, as chief of Douglas' long range program.

E. C. Faure, manager of Boeing Aircraft Corp.'s Building, Cold, Dynamics, and research division of Boeing Research and Development, Inc., a subsidiary.

Dr. Arthur Radford, director of the new Central Research Division, Defense Systems Laboratory of the Army Ballistic Missile Agency, Redstone Arsenal, Ala., and John L. McDonald, technical director, Research Laboratories have been established at Dr. Radford's direction, the former being responsible for solid propellant rocket motors.

General Electric has assigned Advanced Design Laboratories—Charles W. Haney, Project Leader, Harry Blodgett, General Control and Aerohydrodynamics, and the General Laboratories—Lester C. Geller, Vice-President and Young Laboratories, William L. Carlson.

Changes

John A. Cooper has joined the Technical Staff of National Engineering Science Co., Pasadena, Calif.

Harry E. Garske, program manager, Master aircraft programs, Douglas Aircraft Co., Inc., Los Angeles, Calif., has joined the Co.'s General Systems Group has succeeded the following apprenticeship: Dr. Norberto Yane, associate laboratory manager-research and development, Senior Langley aircraft laboratory manager-project engineering; William C. Willey, chief scientist.

INDUSTRY OBSERVER

► **Tested!** Chevrolet Corp. has a \$400,000 Air Force contract to study types of nuclear propulsion feasible for space travel. Study will be handled by Thiokol's new Nuclear Development Center, Troy Hills, N. Y., with assistance from Liquid Diamonds of Union Carbide, Allison Division of General Motors and Nuclear Development Corp. of America. National Aeronautics and Space Administration has given Lockheed Aircraft and the Martin Co. contracts to study nuclear rocket flight test concepts under Project Rover, and USAF and NASA will be able to pool information from these studies.

► Eighteen teams from NASA's Space Task Group in working full time at Langley Research Center on conceptual aspects of Project Apollo, assess space progress following Project Mercury. Team is working under a \$1 million loan for fiscal 1962. NASA eventually will have detail design done by industry on the basic reentry configuration and on subsystems which can't be supplied by the Mercury capsule.

► Watch for Grumman Aircraft Engineering Corp. to propose a three-seat version of its Gulfstream two-tripdeck executive transport with four seats beyond the wing roots. Additional power would increase range and speed, making the aircraft competitive with Lockheed's JetStar in a transcontinental transport.

► Sound of 90 lbs. charges exploded in the ocean has been heard 12,000 mi away, across half the world to around the earth. Charges fired by a Columbia University research ship west of Australia were transmitted along an underwater sound channel and picked up at Bermuda. NASA scientists feel this indicates there is no significant range limit to underwater detection.

► Among Navy-supported programs aimed at providing Polaris missile sub warheads with secure, long distance communications systems, General Electric's long range, underwater communications system is now reported able to span distances up to several hundred miles. Program is to be reported on Aug. 26. Cooley Division's London long-range submarine communications, another underwater system, and on RCA's David Sarnoff Research Center's Project Pionglos, a \$100 million Polaris study incorporating noise techniques for communications between missile submarines and aircraft surface vessels and other submarines.

► First launch of a Titan I missile from Vandenberg AFB is scheduled for Oct. 15. Titan will not be launched from a silo, but rather will be raised hydraulically to the exhaust before firing.

► General Electric's first engine test (Aug. 8, p. 94) flight test program is under consideration by Army, which will probably submit a definite proposal to Defense Department for approval within two to three weeks. When selling point will be low cost and the ability to refuel two of the lift fan engines powered by GE 351 turboprops in an existing aircraft. Preliminary studies have been made of problems involved in mounting the engines in the wing roots of a North American T-33 trainer.

► Martin-Davies has called for bids for installation of Air Force Trim IC3BMs in their site laboratories. More than five companies are bidding and Douglas Aircraft Co. apparently is the leading contender, offering the same staff which managed this deployment in the United Kingdom.

► Watch for announcement of the Army expanding short drag takeoff test program from NASA's Stow (AW Job 13, p. 54) to a larger booster.

► Thand is a new version of Diamon-Dyne equipped with three solid fuel boost rockets proposed to Air Force and National Aeronautics and Space Administration. Solid rockets would be mounted on Thand's sides to improve either performance or payload and would be held in place by their own thrust until they ejected automatically at burnout. Burnout rockets would be made by Armat or Allis-Chalmers Laboratories.

► McDonnell Aircraft Corp. has delivered four Project Mercury capsules to National Aeronautics and Space Administration. NASA is buying 24 capsules from McDonnell for the Mercury program.

HAYNES
ALLOYS



RESEARCH REPORTS

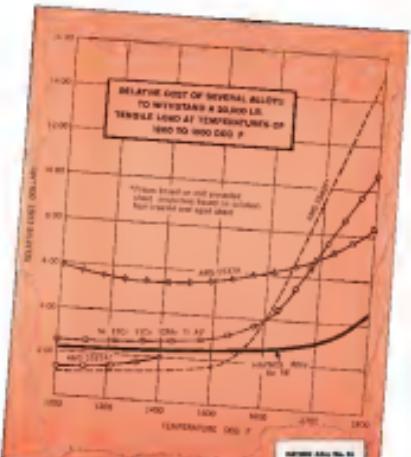
New High-Temperature Alloy Improves Cost-To-Strength Ratio

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Washington Roundup

Rader Subs for York

John Rader will handle top-level Pentagon technical decisions while Defense Director of Research and Engineering Elmer York is recovering from a heart attack. Rader, a former B-57 aircraft commander, replaces York's deputy. One of the key areas he will handle is expansion of the D-70 budget program.

Rader has more than 10 years in York's organization. He is a lead-level engineer of what he considers much optimistic development schedules and price tags. York was impressed by Rader's earlier action in avoiding disputes for strategic weapons in withholding approval of the Skunk Works' program until Air Force and Douglas Aircraft improved its management organizations and produced more realistic objectives and timetable.

This episode initially made Rader some enemies among top USAF officials. Subsequently, most agreed that the Skunk Works program was more realistic in the result of his objectives.

Now faced a severe budget squeeze from Joint Chiefs of Staff orders to strengthen nuclear forces in the Midwestern and Far East, it will cut an extra \$500 million this fiscal year to add a carrier to the Midwestern Skunk Fleet and keep them on track for maximum deployment with the Far East Seventh Fleet.

This cuts money has to be squeezed out of the current Navy budget. Higher expenses come from increased ship acquisition and maintenance, higher aircraft demand and replacement rates and greater personnel turnover.

Civilian AFOSR Chief

Air Force has departed from past practice and named a civilian to head its Office of Scientific Research. First civilian director of AFOSR will be Dr. Harry Milhaupt, who will succeed short-term director of the former Research Division. Dr. Milhaupt will replace Col. A. P. Gage, who has been with AFOSR since 1956. Gage commanded AFOSR during the recent dispute in which the scientific group left Research Division via terminating his cause rate.

Col. Gage, who will join AFOSR until Dr. Milhaupt takes over about Oct. 1, now directs currently a dual directorate of Air Force Missile Development Center.

Air Force is making Defense Department to release part of the \$574 million proposed by Congress for strategic missile Air Transport Service modernization. USAF wants to launch the modernization program by buying 18 Lockheed C-130Hs at \$7.4 million each. C-130 is an extended range version of the C-130.

Exploration of an American delegation in an international tribunel conference in Moscow highlights the serious deterioration in relations with the U.S. between the U.S. president and the Soviet president. Both sides to America invited to an official industrial conference, a more serious move than the more recent expansion of contacts and visits or the reciprocal exchange of diplomatic personnel.

Senate Work Lagging

Lagging Senate action on high priority weapons issues there is little chance space act changes will be passed during the August session. President Eisenhower called for establishment of the National Space Council and the Civil-Airspace Union Committee, and for a new peace plan, and the House approved the change. Now this will die in the Senate.

Conversely Bill to prohibit orbital air war fleet status under usual status based for the same date. This bill has passed the Senate, except from rewording and the House passed last October, but the Senate will probably not act on it. Neither the Senate nor the House will consider bills to bar the use of nuclear warheads against flights.

No Senate action is expected this session on House-passed legislation to tighten cost and profit margins on missile contracts. Senate Armed Services Committee will soon consider a 10 mg report on Defense Department procurement practices which was approved last week by a subcommittee headed by Sen. Strom Thurmond.

Rep. Carl Ballou, head of the House Military Operations Subcommittee, may launch an investigation of ICBM bus delays after the current session. Hearings may be scheduled the week after Congress adjourns if committee members can afford.

Research on noise, from aircraft, missiles and solid rocket vehicles will be investigated this week by the House Committee on Science and Astronautics. Committee wants to find out how much research is being done, on characteristics of noise hazards from these sources. Its Abbott National Aerospace and Space Administration's directive of advanced research programs is to be lead written in the hearings, scheduled Aug. 22-23.

—Washington Staff

Russia, U.S. Spar Over Space Cooperation

USSR seeks veto for it and U. S. in International Astronautical Federation, plus assured offshoots.

By Evert Clark

Stockholm—Soviet Russia objected publicly to the 12th annual International Astronautical Congress last week, viewing as otherwise highly successful meeting Russia seeking veto power for itself and the U. S. in the 29-nation International Astronautical Federation, plus a guarantee that both countries are represented among top officers each year.

This would put the offshoots and top power issues over discussion of Japan on a subsidiary basis, which the U. S. and most small nations oppose. There is no precedent for that kind of decision with international scientific unions which even for ultimate exchange although the Russians made a similar issue regarding the Committee for Space Research of the International Council of Scientific Unions and was a partial victory (AW Dec. 14, p. 26).

Soviet Russia declined to participate in the new International Astronautics Academy although the founder, contractor Aeroflot, and top Russian government officials were present. The name added Prof. Levon Sodis, president of the IAF, and two other Soviet delegates attending the congress.

Space Law Institute

Soviet delegates also declined full participation in the new International Institute of Space Law despite member delegations invited for their own but left the door slightly open for greater participation later.

An urgent need to develop space law is among the uppermost concerns.

Credit to examples of growing problems are the U. S. AB 42 nuclear warhead satellites, Soviet Pacific pocket ships, Asia bring into the Indian Ocean, plan conflicts and space probes.

The Soviets abstained from voting for approval of the Academy and Institute rules at last year's congress in London. Veto and guaranteed offshoots were used last May when Soviet called IAF officers to a Hockenheim meeting in regard to using the "10-month" constitution. Had that veto power exercised at the London meeting, the Soviet leadership would have liked the Academy and Institute, rather than others.

Academy Seats

Two Czechoslovak scientists and one Bulgarian have accepted Academy seats. One Belarus, managing Institute Prof. Elena S. W. Manay, who is a member of Britain's Royal Society and former chairman of the British National Committee on Space Research, declined an Academy seat, offering the same reason to the Russians. Manay and "international recognition" is a theme. No one is doing research."

A few days after declining members-

sought for the first time and had a record 500 technical enrichment with 500 delegates from 29 nations. A record number of more than 100 technical reports were of a quality generally well above last year.

Among the best received were photographs and details of the parade of the missile by Prof. Alexander Mikhalov, director of the Lebedin Observatory, also spoke in English. He was followed by Werner von Braun, of National Aerospace and Space Administration, who discussed the Saturn program.

Dominant Notices

The effort to illustrate how the U. S. and Russia dominate the meeting because of space achievements and also demonstrates the great value of an international exchange on an international scale were well received. Some presented most details in mosaic photographs to the American Rocket Society last November. Most details on the Soviet report had appeared at U. S. congressional hearings but both reports obviously were new to numerous delegations.

Another indication of predominance of the two nations was that last but sixth Sodis was the leading candidate to continue in the presidency for an extra term. Von Braun is expected to win one of five vice presidencies, probably paving the way for election to the position of the next congress in New York.

Since the last congress, Russia has imported the name, photographed its Iskra-1 and Iskra-2, Sprut-IV, in the same time, the U. S. launched 11 satellites, orbited Maha, Tens, Tensat and Echo series, sent a probe toward Venus, recovered a Discoverer capsule, and tested the Mercury capsule on flight.

U-2 Flight

Speaker Broadbent, special counsel for the House Science and Astronautics Committee, speaking at a public forum, said the Russians had agreed to fly a flight and make a visit of three delegations. The U. S. delegation requested that the visit be the week and discovered a firm stand favoring representation because of achievement instead of numbers; plus an equal voice for small nations. A wish reflected Russia's possible out. U. S. delegates denied that Russia expected the strong opposition it met, the entire situation was founded behind the scenes for five days at a policy kept secret but open formal discussion was due but failed.

Otherwise, the U. S. was the first link in a chain of novel events leading to withdrawal and use of surveillance satellites, Berlin Wall and International agreement on space law as urgently needed before events get uncontrolled. If arms inspection and control are ever accepted, surveillance satellites will help enforce that law, he said.

The congress required quadruple ins-



B-70 Engine Inlet, Wing Tip Folding Configuration

Knock-type engine inlets on the North American B-70 Valkyrie is shown in the out-and-by-the-way configuration on its F-104 strakes, which was light tested successfully but never selected production. The Valkyrie was the first aircraft to receive the out-and-by-the-way due to upfolding of the strakes on the inlet lips. North American also had a design with the experience wing-type inlet on the North American aircraft (see pg. 4648). High aerodynamic efficiency of the B-70 is achieved largely because the engine air duct is shaped to create a high pressure region under the outer wing during cruise. The wing tips can be turned down (inward) to improve this efficiency by turning flow under the wing downward.

Democrats Drop Plans to Consider Major Fund Increase for Defense

Washington—The Senate Democratic leadership dropped plans last week to consider an early new defense appropriation at the pre-election Congress session after reviewing the views of Defense Secretary Thomas S. Gates.

Rep. John J. LaFalce, Sen. George S. McGovern and Chairman of the Senate Appropriations Subcommittee, recommended no increases in new Fiscal 1961 appropriations (AW Aug. 8, p. 25). Gates and I say more in our review will consider additional sum for military personnel and operation and maintenance.

"Otherwise, I face no additional requirements. But . . . all our programs, field levels and deployments are kept under constant review. As you know, all of our defense programs are continually influenced by changes in the world situation, by technological developments and by schedule changes developing during the course of the year.

We are now assessing the impact of all such changes in connection with the preparation of the fiscal year 1962 budget. That work will take a significant bearing on the levels of funding proposed for the defense budget at this legislative session, particularly at this level of our defense effort. The decisions pertaining to these programs will involve both fiscal years 1961 and 1962.

"We world, of course, carefully consider all defense actions by the Congress, but we cannot say predict whether we could produce balanced additional funds which the Congress might appropriate."

Democratic Interpretation

Democrats interpreted Gates' observations in indicating that additional congressional appropriations would be likely. Sen. Strom Thurmond (R. S. C.) told the Senate the Secretary of Defense states that he sees no need for additional

funds at this time. . . . Nor is any commitment given that any additional funds provided by the Congress would actually be used."

Meanwhile, Sen. Johnson reported his demands that the Administration release approximately \$1.6 billion in defense funds already voted by Congress and by Johnson leaders defended the Administration defense program with a series of points on the Senate floor pointing to several successful worldwide space advances to support their case. Defense Department's Aug. 9 financial plan before 9021 session. An additional \$575 million has been withheld from the pending spending further savings (AW Aug. 15, p. 26).

Promising to accomplish long-range weapons testing of Navy's Polaris missile and Air Force recovery of a Discoverer space capsule, Sen. Robert Byrd (D. W. Y.) told the Senate the following:

"The events of the last few days should get us to end to futile political wrangling at the defense program of the Eisenhower Administration. The fact of the matter is that while some politicians have been talking, the Defense Department has been working."

Soviets Begin U-2 Pilot Espionage Trial

Moscow-USSR. After testimony at the espionage trial at U-2 pilot Francis Gary Powers described as "partisan" by Powers, the defense team of Powers' lawyer, John C. Dickey, and Powers' attorney, James J. Dunn, have been unable to gain any concession from the Soviet Union.

What little was related was spelled out in some significant detail in the indictment issued earlier which charged Powers with flying over Soviet territory for espionage purposes, to which Powers pleaded guilty at the beginning of the trial.

The indictment stated:

- Powers was owned by Col. Shulkin, described as the commanding officer of Reconnaissance Detachment 10-10 in which Powers served, to give special attention to two points as far as he can, namely, launching site and the effect on the Soviet defense system. The former is presented as Powers' launching site at Tuzla, Yugoslavia; the latter as "the possible damage to the Soviet Union."

* Identity certificate carried in the U-2 bore the inscription A.F. I. D-238-865 and "Department of Defense, the United States of America." Powers carried a certificate issued Jan. 1, 1958, at Incirlik, Turkey, where Powers' unit was based, which Powers told the Russian court was in the name of National Aerospace and Space Administration and authorized him as a member to fly in Air Force aircraft.

Powers' Testimony

At the trial, Powers testified that he didn't know whether he had any formal connection with NASA, that "I never met any person at that organization." He added: "Another [person], I presume, is to cover up as intelligence agent, but there are just plain pooh-pooh. No one told me so I don't know."

* Soviets continued to assert Powers was shot down by a Soviet anti-aircraft rocket at an altitude of 65,000 ft (IAW Mo. 16, p. 26). But a Soviet witness, P. V. Serein, quoted in the indictment, said he heard a sharp crackling sound, a jet engine stopped, but didn't see smoke from his aircraft. Attracted by the noise, the witness and he went out the door to find out what was happening. Instead, saw a cloud of smoke in the sky and sighted a white object coming down which turned out to be Powers in a paraplane.

In the indictment, Powers is quoted describing the site of the U-2.

"Quite unexpectedly I heard a kind of hollow explosion and saw no missile flash. This plane suddenly pitched down, and I think, its wings and tail started falling off, perhaps the plane was not hit directly and the re-

lition took place near the plane and it was hit by the burst and fragments."

That is, it happened at the altitude of about 65,000 ft. It was shot down about 25-30 mi north of northeast of Tuzla.

"At that moment I was trying to the most undeterred as we start with assault. When the plane began to fall down I was passed to the control panel and could not see the cockpit. I opened the canopy, unlatched the steps and got out from the plane through the top. The procedure operated automatically."

Nothing similar testimony at the trial, Radio Moscow commented, "This again dispels the mendacious accusations to the U.S. side concerning powers that Powers' aircraft was brought down at a low altitude." The Soviet model noted the U.S. aircraft at the same time altitude at which it was capable of flying."

Border Alert

Noting similar testimony at the trial, Radio Moscow commented, "This again dispels the mendacious accusations to the U.S. side concerning powers that Powers' aircraft was brought down at a low altitude." The Soviet model noted the U.S. aircraft at the same time altitude at which it was capable of flying."

Red Weather

Through this was made U.S. statements that nuclear-armed bombers had kept continually aloft, the indictment alleged that "reconnaissance flights involving photographing of possible bombing targets and spacing of radar installations represent components of a nuclear attack from the air. Under such circumstances, interests of foreign aircraft would be the basis of the USSR's interest in our flights."

At the trial, Powers testified that he had had bad weather all the time from the beginning of an altitude of 65,000 ft up to the end of the flight.

There is nothing to guarantee that an such place appearing over Soviet

Minuteman Engine

Air Force selected Hercules Prop. & Co., Wilmington, Del., as the producer since the third stage rocket engine for the Minuteman ICBM Project will be performed at Hercules plant in Bucks, Pa. Hercules and Avco General Corp. have been working on the project under research and development contracts and have been in competition for the third stage production contract.

Hercules will incorporate the following advances in rocket technology:

• Dual paraffin with the highest specific impulse of any measured to date.

* Two new engines for Minuteman vehicles.

* Thrust termination features which enables the range to be extended and accuracy improved.

* Solid identification of the various controls on the U-2 was absent. One was described as Model 731B, serial number 73140, and designed for photographing strips of terrain 100-120 mi wide from high altitude. Either the indictment or the transcript gives a high strength/toughness ratio.

testimony does not carry a deadly load,"

For the first and Powers' cell, he represented by So-an defense counsel.

Soviets in the indictment made much of Powers' report of a test by USAF Chief of Staff Gen. Thomas D. White especially to inspect Detachment 10-10 in April 1962 and the visit by Lt. Gen. Frank F. Tamm, commander in chief of USAF in Europe, and other USAF generals.

This was an omission in the trial where the Russian prosecutor made minute reference to a visit by Powers' Captain, Captain, Russian Catholic archbishop of New York, with a question about the Catholic priest in custody.

The Captain's visit to Catholic Vicar to the same forces may have been known to Powers, who responded back at the proceedings that, "I could say he was associated as military personnel, not in base."

Powers has a reasonable red web in his left eye under the eye. In response to a defense witness question, Powers said that was a birthmark. He said he had been treated well by the Russians.

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At the trial, Powers testified that the U-2 could under countermeasures equipment to distort radio signals used at both from ground station and other aircraft.

When the Soviet pilot not only

but was not clear on whether this was the case.

Other equipment mentioned in

clad:

- * Radio electronic reconnaissance apparatus made by Herstek Pielcky Co. and Higgins Laboratory.
- * U-2 torque magnet made by Pratt & Whitney Aircraft.
- * Engine starter by Hercules-Stardust and battery by General Electric.

Weapons Examined

The indictment stated that "the special expert technical commission, that reviewed U-2 wreckage, has established that the plane had a radio electronic device connected with a radio frequency detector with a roll of four-millimeter tape for eight hours of continuous operation. The sound recorder has the index number M-12579 and the serial number 769. It had a direct recording tape reading mechanism made by Club Institute, Inc., of Tuzla, China. The decoding of the magnetic signals recorded on the four-millimeter tape has shown these signals to belong to ground radio stations of the air defense of the Soviet Union."

"These recordings can serve to determine the range of radio frequency on which the reconstructed radio stations operate, the frequency of emission of a plane by a radio station and the size of its dishenna and the number and operating mode of radio stations in service." The indictment can serve to determine the range of radio frequency on which the reconstructed radio stations operate, the frequency of emission of a plane by a radio station and the size of its dishenna and the number and operating mode of radio stations in service."

He reported for training under the command name of Polkovnik.

Powers said he had made several long-range flights along the southern borders of the Soviet Union but that his May 1 flight was his first formal presentation of Soviet airports.

The indictment quoted Powers as saying that:

"We would take off from Irkutsk airfield and would fly westward as far as the town of Van around in the lake of the same name. After that we would proceed to Tashkent, the capital of Iran, and from there proceed to Urumchi, the capital of the Chinese Sea."

After that Powers flew north west of Mazar-i-Sharif, crossed the Hindu Kush and flew farther along the Afghan-Soviet frontier, not far from the eastern frontier of Pakistan, a long way south and we returned to Irkutsk, distance taking the same route. Later on we began making a return earlier after penetrating Afghan territory for about 200 mi."

Alternate Plan

The indictment said Powers was brought from Irkutsk to Peshawar via a C-47 transport on April 27 with Col. Shulkin, commander of the 10-10 Detachment, and 20 men assigned to prepare the U-2 mission. The U-2 was flown to Peshawar on April 28 to another pilot at the U-2 Detachment.

Powers stated in the indictment that

he was briefed to use any airfield in Finland, Norway, Sweden or East as an alternate to his original destination of Bodø, Norway, if the flight encountered difficulties. Powers had been made for an alternate route to land at Sodankylä or Inari in Finland in case fuel shortage developed on the final leg of the flight.

CIA Employee

The indictment quoted Powers as stating that he had signed a contract with the Central Intelligence Agency in 1959, and that SL-1, the aircraft he had established as the plane, had a radio electronic device connected with a radio frequency detector with a roll of four-millimeter tape for eight hours of continuous operation. The sound recorder has the index number M-12579 and the serial number 769. It had a direct recording tape reading mechanism made by Club Institute, Inc., of Tuzla, China. The decoding of the magnetic signals recorded on the four-millimeter tape has shown these signals to belong to ground radio stations of the air defense of the Soviet Union."

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Powers said he had made several long-range flights along the southern borders of the Soviet Union but that his May 1 flight was his first formal presentation of Soviet airports.

The indictment quoted Powers as saying that:

"We would take off from Irkutsk airfield and would fly westward as far as the town of Van around in the lake of the same name. After that we would proceed to Tashkent, the capital of Iran, and from there proceed to Urumchi, the capital of the Chinese Sea."

After that Powers flew north west of Mazar-i-Sharif, crossed the Hindu Kush and flew farther along the Afghan-Soviet frontier, not far from the eastern frontier of Pakistan, a long way south and we returned to Irkutsk, distance taking the same route. Later on we began making a return earlier after penetrating Afghan territory for about 200 mi."

Five Companies Study Space Tracking Net

Washington—Several companies are working on an order to design tracking device that could save piles of information gathered by the Soviet space program.

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Alternate Plan

The indictment said Powers was brought from Irkutsk to Peshawar via a C-47 transport on April 27 with Col. Shulkin, commander of the 10-10 Detachment, and 20 men assigned to prepare the U-2 mission. The U-2 was flown to Peshawar on April 28 to another pilot at the U-2 Detachment.

Powers stated in the indictment that

he was briefed to use any airfield in Finland, Norway, Sweden or East as an alternate to his original destination of Bodø, Norway, if the flight encountered difficulties. Powers had been made for an alternate route to land at Sodankylä or Inari in Finland in case fuel shortage developed on the final leg of the flight.

Powers maintained that the U-2 he flew caused an extensive declassification marks despite Soviet prosecution's contention that getting less to admit their national identification marks had been pointed out to her in case.

Torture Challenged

Prisoners challenged their testimony by Engineering Lt. Col. Yan Trifunin, who had claimed that through examination of the brains of poison on the aircraft U-2 had proved to have lost the plane never caused any identification marks. The Soviet government claims the plane carried no markings because its sole mission was espionage and not weather reconnaissance.

Powers said he had seen the plane at his base for several months prior to the flight and "I always saw it with identification marks."

"Would it have been possible for the identification marks to be over the painted surface of the plane?" Powers asked.

"It is believed that could have been done," Trifunin responded.

However, equipment recovered from Powers' U-2 contained identification identification plates labeling it as manufacturing code and military aircraft, including contract identification and serial numbers.

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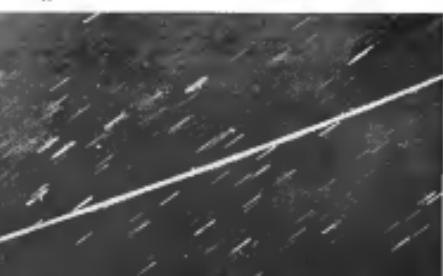
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ECHO I satellite is shown atop the SDI long Delta vehicle at Cape Canaveral. This aluminum-coated satellite is used to test earth returns. Below, the balloon satellite makes a trek in clear sky over Wimipeg, Man., Can., in a half hour exposure in which stars appear as streaks.



Echo I Satellite

Washington—National Aeronautics and Space Administration's Echo I performed communications satellite flying in a 1,000 mi. near circular orbit will provide earth-to-earth communications for a week with signal strength within 1/2 decibel of predicted performance.

Following a series of demonstrations of the possibilities of bouncing radio signals off the 100-ft diameter metallic inflatable sphere, scientists were turning to make a variety of separate measurements which may hold the key to the future usefulness of such passive communications satellites for voice and television circuits. Satellite was launched Aug. 12 with a 7-18 day useful lifetime prediction.

The transmission from President Eisenhower was the first to be transmitted between National Aeronautics and Space Administration's Goldstone, Calif., facility and Bell Telephone Laboratories in Holmdel, N. J., during Echo I's first pass over the U.S. The President's message emphasized that scientists of all nations can live to the satellite for experimentation.

First reported human voice communication using Echo I was made in the month after by Collins Radio and its subsidiary, the Alpha Corp., in the early hours of Aug. 13 between Cedar Rapids, Iowa, and Dallas, Tex. On the 12th orbit, the first NASA moonway voice communication system in Echo's history was carried out between Goldstone and Holmdel.

During the 22nd pass, Naval Research Laboratory joined in a two-satellite experiment in which noise was transferred from NRL facility near Washington, D. C., in Echo to Holmdel, then returned by the satellite to Goldstone.

On the first orbit, an Air Force Ballistic Missile Early Warning Station installation at Thule, Greenland, transmitted a signal to the Rome Air Development Center facility at Floyd, N. Y., via the satellite.

Circular Orbit

A 1-mm precision placed into the planned nozzle slot with a gap of 1.045 in. and a range of 347 mi. Period is 113.3 days, and the 47.2 deg inclination places the orbital path over the most heavily populated areas of the earth.

This launch represented first successful use of the Douglas Delta launch vehicle, which NASA labels its interim workhorse vehicle for 12 basic payloads over the next two years (AWW No. 9, p. 28).

Three-stage, 93-ft Delta consists of Thor booster with 150,000-lb thrust

Meets Coast-to-Coast Communications Goals

Rocketdyne liquid fuel engine, 7,500-lb thrust Aerojet-General AJ10-115 (able) liquid fuel second stage, and 3,000 lb thrust Hercules Pegasus Co-Alloyed Ballistic Laboratory 248 solid propellant third stage.

Balloon communications systems developed by Bell Telephone Laboratories negated for Titan missile took over control from Thor about 90 sec after launch and directed its flight for the next 185 sec. Douglas flight controllers guided the stretched second and third stages during 300-second period. Both ITL and Douglas guidance packages fire housed in the second stage.

Flight controller possessed the desired stage along the desired orbital path during the cover phase, and ABL-248 inserted the 20.5-in. magnesium payload container into orbit with 100% of planned flight. Payload was supported by a tension spring. Third stage was fitted with nozzles to make it rotatable, mounting drag and preventing the 92 lb spent engine from colliding with the 191.8-lb payload.

Sphere Inflated

Two months after injection, payload capsules were separated by a delayed burst of the upper stage. Sphere was inflated by expansion of compressed air. 10 lb of helium and 20 lb of argon maintained both inflation chambers, both adding weight per unit.

Payload, optics and inflation techniques demonstrated in Project Echo also apply to future earth-to-space satellite projects planned by NASA.

William J. O'Sullivan Jr., head of NASA's Space Vehicle Group at Langley Research Center, O'Halloran Field Annex, Wash., operation of the Echo satellite was a general proof that the vehicle automatically reacted to space. Optics and inflation processes for the 100-ft sphere were tested at altitude ranging from 200-250 mi. in five habitats, brackets and bell and under the press for the successful test sequence provided the first flight test in space of a passive satellite.

Echo came through its first launch without serious effects as withstanding the usual launch microshocks, shaker, which won at its maximum Aug. 12. O'Sullivan said for the first three to seven days of its lifetime, Echo will "take a beating" with as many as several sets of microelectronic packages. He estimated the sphere will survive at least 100 hr in space, probably more, with the survival of the satellite depending on the rate of degradation of the materials.

Earlier Boston and Vergnaud inflatable sphere experiments which would have provided a standard for measuring atmospheric density as it affects the orbit did not produce any information because of launch vehicle failure.

Inflated orbital elements were provided by a balloon on the collar of the third stage, which also went into orbit. International Business Machines 709 computer at Goddard Space Flight Center computed orbital path for passage out of ITL and ITL reference.

To a great extent, Echo carries two Raytheon radars, made by Raytheon Company of America, each weighing only 11 lb and transmitting at a frequency of 907.9 mc. Each transponder, provided by 76 solar cells and fed solar cells, has an output of 5 milliwatts. Transmitter, solar cells, batteries and a small ship antenna, which smooth side sphere is inflated in orbit, are mounted in 10-in. diameter dia. d. in thick structure to the balloon. The pressurized water tank contains inflation reservoirs, solar panels and power supplies so that one solar cell array can power both transmitters if one is shadowed from the sun.

Space Structures

Langley Field, Va.—Inflatable earth-orbit vehicles, solar collectors and other large space structures with an area of 100 sq ft or greater are planned for inflation in the Echo I satellite, according to William J. O'Sullivan, Jr., head of National Aeronautics and Space Administration's Space Vehicle Group at Langley Research Center, O'Halloran Field Annex.

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Space Vehicle Group maintains numerous use of inflatable in orbit, structures in energy vehicles and also in space research vehicles, named orbiting balloons, pilot escape "life boats" and orbital ship.

These space structures would be developed in light-weight materials such as Mylar used in Echo, and they could be configured for specific missions. Packaged in extremely small containers, the vehicles would be mounted on space penetrators, microshells, microshells like as bell or by spinning.

Performance over the Goldstone-Holmdel link required as much power information becoming available as the orbital orbit, permitting more accurate pointing of instruments and recovering antennas. In only last week, earth-to-earth transmissions at a frequency of 960 mc were passing signal-to-noise ratios of about 40 dB. These are within several decibels of values predicted on the basis of existing theory and information.

Aerospace Used

The Goldstone facility, operated by Jet Propulsion Laboratory, uses two 83 ft dia parabolic antennas, one for transmitting, the other for receiving. At Goldstone, a 60 ft dia parabolic antenna is used for transmission and a novel high-gain horn reflector with a 20 ft square mouth is used for receiving. An extremely low-loss, relay Main, coated to liquid helium temperatures, is used in the JPL receiver.

Last week, ITL and ITL scientists had started to implement series of experiments to determine performance of different methods for launching, including single orbiter, frequency and phase modulation. Other measurements will include atmospheric refraction of signals, particularly near the horizon, path loss and noise.

Satellites are being instrumented with seismic polarimeters to check on possible disruptions of the satellite from its required spherical shape, due to micro-meteorite impact or other causes. An important change in attitude spherical will cause change in the received signal polarization.

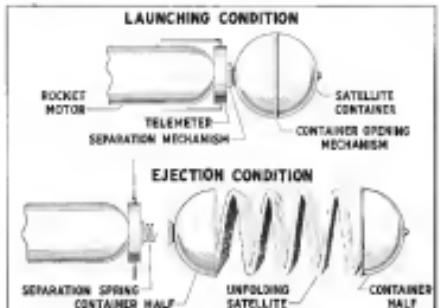
Using smaller (lower-altitude) instruments, Collins obtained highly satisfactory results in an North Sea communications satellite test. At Cagin Rapid, the company used 12 ft dia parabolic as antenna, while in Dallas installation employed a 20-ft antenna for transmitting and a 40-ft dish for receiving. Quality of reception in the initial stratosphere was rated at 11.0 dB or better.

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The Collins program, entirely con-



HORN-SHAPED antenna at Bell Telephone Laboratories' research facility at Holmdel, N.J., is used to capture radio signals reflected from Telstar satellite. Dish at left end of the horn houses radio receiver and a relay motor; amplitude which is reflected is -450 deg. by liquid helium. The 50-ft antenna is rotated by the weight wheel. A 60-ft dish transmitter is located outside. In addition, Alpha Centauri, a Collins Radio transponder, reflected a 40-ft parabolic deep space probe tracking antenna at Kickapoo, Tex., which automatically locked onto the reflected signal from Collins Radio Institute of Cedar Rapids, Iowa, and tracked the spherical satellite on each orbit from horizon to horizon.



DRAWINGS show the launch and ejection sequence of Project Telstar's inflatable sphere, which was folded in a 26-in. diameter metal container. On injection into orbit, the container separated from the jettisoned first stage and then started the sequence.

gate amplitude and phase distortion experienced in satellite-borne communications, which will determine quality, reliability and bandwidth of communications possible by this technique. Collins also plans to measure path loss and atmospheric absorption and to evaluate communications and tracking equipment.

Compass spokesman can say that signal strength obtained in its initial Telstar I experiments is about 5 db below predicted value, but attributes this to incomplete tuning of the antennas in the satellite and performance of equipment which was assembled on a new math program basis.

The Air Force's Trinidad-Nev. York link is operating on 2,800 mc with full rate and voice transmission. Messages are transmitted from Trinidad and received at Floyd, N.Y. The 50-ft Trinidad dish antenna was modified for the experiment and equipped with a radio frequency booster assembly. Signals are received at the Floyd site via a 30-ft dish antenna.

NASA Has Suspended Geodetic Satellite Work

Washington—National Accountants and Space Administration has suspended its geodetic satellite program and is continuing it with the Defense Department to determine which agency should carry out the project.

Navy says it will build a geodetic衛星 on a Trident navigational satellite in a high-altitude experiment later this year (AVN Aug. 25, p. 25). NASA had planned to launch a faring light geodetic satellite as a Delta-II boosted payload in 1962 and had set aside \$1.22 million for research and development on the program for the current fiscal year.

Work on the project has been stopped at NASA's Goddard Space Flight Center and the agency is offering 14 firms which submitted instrumentation proposals that funding is being deferred.

Unit Monitors Pilot, Vehicle Performance

System for instruments ground monitoring of the conditions of a pilot and his high-performance aircraft as presented during development for the Air Force's Project Castle, the Grumman XLR-11, the Interspace Techno-Mil, G-III, the Interspace Telephase and Teleglobe laboratories.

Ground controllers will display data on the pilot's physiological condition, and on vehicle performance and environment. First unit is scheduled to be in operation early next year at Edwards AFB.

First Capsule Recovered From Satellite

By Larry Bonds

Washington—First known recovery of a man-made object from orbit was made by Air Force Aug. 11 when the re-entering capsule from Discoverer XIII was recovered from the Pacific Ocean 500 mi northwest of Oahu, Hawaii.

Serious efforts came at a close examination of the satellite reentry concept and its feasibility. Feasibility was determined by a letter from the Department of Defense and the Administration. Since the first try in April, 1958, with Discoverer II, attempts at reentry into the atmosphere with parabolic descent were deemed to have failed.

Discoverer XIII was launched from Vandenberg AFB Aug. 10 with a Atlas and Douglas Thor IRBM first stage and Lockheed space capsule. Argon second stage containing a Convair Electric capsule. Satellite orbited the earth in a polar orbit other 17 times before the signal for reentry and recovery.

C. G. Bassett-Arnold, manager, director of the Air Research and Development Command, and the participant in the Thor-XIII flight, said the capsule was much different from Discoverer XII, which had longitudinal monitoring of the six separate events leading to entry in order to diagnose the problems which plagued earlier entries. He indicated that the success will speed the Samos reconnaissance and the Atlas ballistic missile detection satellite programs and that some experience gained would be of value in the Project Mercury man-in-space program.

C. G. Bassett indicated that, in a 90-10 chance of success in orbits, two total of about 75 launches are planned at a rate of about three a month. Discoverer XV is scheduled as a 150-deg. faring a spider mission, weighing four tons, in January. Models of the same engineering training. Official specimens are due for later satellite flights.

Recovery Effort

Recovery operations, coordinated by the Pacific Missile Range Command, involved an air search and surface units. For C-130 and Lockheed C-130B in the Air Force were given the job to search the probable home capsule area, the sea down and land sampled to a broken broken layer of clouds at 10,000 ft. Descent of the capsule is monitored in ground stations at Kona, Maui and Barbers Point, Hawaii, according to the capsule designer and Dr. Steven Adcock, the Boeing engineer who also used other electronic tracking methods. Aircraft crews also

made the parachute-booster capsule trials.

First recovery was made by a Scan IRIS 3 helicopter, one of two operating from U.S. naval ship the HMAS Victoria, which steamed for an hour and ten minutes until within helicopter range. A Navy helicopter attached a cable to the capsule which was hoisted to the helicopter after 3 hr. as the water. The pilot planned the procedure to minimize the percent of time it took to attach the cable to the capsule. The parabolic drogue weighs 30 lb. operating with 120 lb. for the capsule. Marker capsule weighed 55 lb.

The capsule designed for eventual permanent display in the Smithsonian Institution was flown not for return and recovery. In General Electric's Model and Space Vehicle Department in Philadelphia, this upper portion with high Administration officials President Eisenhower and Discoverer XIII and other space agencies in evidence that the U.S. "leads the world in the activities in the space field that promise real benefit to all mankind."

With flight more than a third of the Thor-XIII already laid, the Air Force has been placed in the position of defending the recovery technique as several doubts have been raised on the

Soviet Space Theme

Washington—Details of the USSR's atomic weapons test policy are the theme which has been appearing in recent Soviet publications. In several issues, that much of the U.S. space effort is inflation and represents "preoccupation from the political viewpoint."

In article written Rostok space administrators gave the beginning of the International Geophysical Year in mid-1956, the bulletin said, "all the Soviet nuclear tests were launched in accordance with the peaceful scientific program, while satellite of Sputniks in the United States was done under the same preoccupation."

The article cited the Discoverer and Apollo programs and pointedly the Apollo program is complex and cost. It is unnecessary that these experiments and ... our own space and satellite programs and space exploration," which is based not on the launching of the American Moby satellite, constitute a long drag in international cooperation and prove critics from the political viewpoint.

These facts are in sharp and implement contrast to planned space research conducted by the Soviet Union, the article said.

quality of information available from satellites through the alternative of electronic medium. Recovery of photographic film in the Sputnik system would be far inferior to stored, taped television television system within the current state of the art.

Current Econodome

This is basically the lesson for the current evaluation of satellite before it would be considered for launching and recovery. Cameras, for example, are now worth of five gross photographic film can record more than 500 feet of magnetic tape and with much greater definition. In the evaluation of technical feasibility, development possibilities and cost must of much more refined television line sensing methods will be considered. Infrared detection also will require a long period of development to produce suitable intelligence in overcast and dark areas of the earth from satellite altitudes.

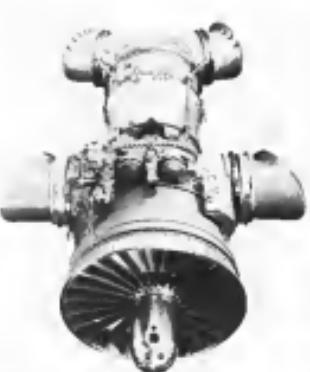
Another area undergoing critical attention is wide-angle cameras, narrow-angle optical sensors, etc., which are used to pick out details from a satellite's body. A wide-angle lens is unnecessary. However, in one pass over an area only a small segment of terrain would be scanned. A wide-angle lens would cover a greater area, but the results would suffer in definition.

Then the question of rapid reentry of satellite by means of reentry of an atomic bomb or a nuclear weapon is raised. One way to pick out details from a satellite's body is to use a single lens or a scanner. However, in one pass over an area only a small segment of terrain would be scanned. A wide-angle lens would cover a greater area, but the results would suffer in definition.

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Discoverer vehicles are launched in a northward direction from Vandenberg AFB prefabricated with an earth station to add the speed of the earth's rotation to that of the vehicle. In the Pt. Mags-Vandenberg complex, the car can run on added difficulties because of the vehicle passing over mountainous areas. Used more powerful first stages are available than older solid fuel boosters.

After successful orbital flight has been accomplished, a specific pass in the north-south flight must be chosen for launching the reentry sequence. With Discoverer XI, the orbital period of 94 min was achieved, resulting having 90 passes. Average 45 sec per orbit, per 361 mi. Sputnik was transported on the 17th pass as the vehicle passed over Alaska. Sixty minutes sequence began at



First Photos of Bristol Siddeley BS 53 Fan Engine

Starting action of four new biflowed nozzles of the 25,000 lb thrust Bristol Siddeley BS 53 have sped up engine (top p. 54) incorporates an unbalanced linear vectoring legend at vertical plane (AVW Aug. 15, p. 67) to give VTOL capability to the Hawker P-1127 close support fighter (AVW Aug. 15, p. 77). Number can be lifted so that my thrust vector can be exploited to not run itself.

Napier Proposes Turboprop DC-7

Washington—Napier Engines Inc., will propose a turboprop version of the Douglas DC-7 cargo transport in the U.S. as a long range passenger or all cargo aircraft.

Performance data of the proposed conversion is based on the configuration of the Napier Herald turboprop engine and 33 ft 6 in diameter propeller. The British manufacturer's cost of fitting and detailed cost due in its initial production.

In its reference performance data compiled for the sales effort, Napier places gross takeoff weight of the DC-7 and DC-7B at 135,000 lb. Gross takeoff weight of the DC-TC is estimated at 145,000 lb. Minimum range length for these takeoff weights is 5,000 ft for the DC-7 and DC-7B and about 4,000 ft for the DC-TC.

Napier quotes minimum landing weight for the DC-7 and DC-7B as 97,600 lb and 102,800 lb respectively, and 112,000 lb for the DC-TC.

Takeoffs climb to a cruise altitude of 20,000 ft for the DC-7 and DC-7B; 21,740 ft over a range of 5,000 mi with a fuel consumption of 2,800 lb and a 130,000 lb takeoff weight. The takeoff rates of the two union partners now being studied by the Snecma version

ALPA Renews Threat Of Sympathy Strike

Washington—Air Line Pilots Assn. renewed its threat last week to call a sympathy strike of all ALPA members along with others served by Southwest Airlines if the local service carriers continue employment of TWA nonunion pilots.

ALPA announced that it has set a definite date for its members to observe the strike: pilot pocket books on 14 cities throughout the Southeast, but would not disclose the date selected on grounds that the information would aid Southwest along with eight other other which strike fled for a U.S. District Court restraining order and injunction to bar such action. The airfares attack American Capital Delta, Trans World, American, Pan Am, United, Pan American, and Braniff.

Southwest's Board, comprising spokesman for the airline, said the strike would be called if the company did not meet its demands.

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It is a component of the Air Force position supporting a strategic command under a ground or an orbital and the Navy position that all involved firms should be under Navy control.

Strategic Targeting Unit

Washington—Strategic targeting was leaving the marking process of Strategic Air Command Polaris bombers and Navy carrier aircraft for the first time was interpreted by Secretary of Defense Thomas S. Gates last week as a major step with eight shades of U.S. world-wide unified military command. Reasons for the move in the gradual shift from dependence on several brother-in-arms of land and sea-based assets.

Centralized targeting planning agency for the Joint Chiefs of Staff will be located at SAC Headquarters in Omaha, Neb. SAC Commander Gen. Thomas S. Power will still retain his present command status from all the services. His responsibilities and management of the allied commands will serve in the group. Decentralized execution plans would be in a 25-city, one-time time will be the responsibility of unified commanders. Power will have a staff of 40 officers, and his deputies will be Vice Adm. John D. Parker, vice chief of Defense Atomic Support Agency.

Power is a component of the Air Force position supporting a strategic command under a ground or an orbital and the Navy position that all involved firms should be under Navy control.

CAB Schedules Action On United-Capital Plan

Washington—Civil Aeronautics Board has scheduled a preliminary conference Sept. 17 on the merger agreement between United Air Lines and Capital Airlines as well as its plan of conducting the hearing process for merger applications.

Confidence data was set one day after the boards of directors of both airlines approved the merger proposal and filed it with the CAB. Stockholders of the two carriers are scheduled to vote on the agreement Oct. 14.



Atlas Launched With GE RVX-2A

First launching of a small to mid-size motor materials was conducted recently when General Electric RVX-2A nose cone with GE solid rocket motor was fired 400 ft down the Atlantic Missile Range in a Convair V-1000. The test was also will include a launch with Avco-developed 200-ft nose cone motor. GE rocket vehicle was equipped with a two-camera television system which helped flight director to keep an eye on the 15-kt. test attempt to examine the vehicle's tail fin when it was. After carried on Avco-developed infrared guidance package planned for use in the Air Force missile series. The nose cone carried a nuclear guidance package and devices to measure X-ray count rates afterburner background, proton and space particle energy rates. Last experiment was designed to collect subsatellite particles which could be used with ion-count rate data to estimate possibility of damage to space vehicles during flight.

Meanwhile, the Board has taken further steps to speed up its hearing process by adding the airlines to submit an extensive environmental description of merger plan which would not be required until the hearing is held.

Earlier, CAB's report to TWA and Northwest was expected to include the Hughes Tool Co., Howard Hughes or the Alfa Corp., if the full information could not be supplied by either airline. The Board asked for the names of all board of directors, executives and stockholders' meetings along with any communications between the two tooling companies and the airlines and a letter from Howard Hughes explaining how he expects to dispose of his stock interest in Alfa. Hughes controls his substantial holdings in Alfa which has substantial interest in Northwest and the Hughes Tool Co., which controls FW-11.

Board also asked for an economic study which may have been based on the assumption that Northwest would be operating jet equipment into the Florida market area and directed that the carriers explain how "if at all" the merger proposal may be contingent upon a revision of Northwest's route estimate for the Florida route.

News Digest

Minneapolis-Honeywell has a \$29 million Navy contract for production of Avirex anti-submarine vessels.

Army Chief of Staff Gen. Lester L. Ladd has recommended that next to succeed Gen. Nathan F. Twining as chairman of the Joint Chiefs of Staff. The appointment could signal some shifts at high military command levels because of the variety of levels of the Army, plus the possibility that Gen. Louis W. Coster may have to resign as commanding general of Ninth Air Force. Commandership of Ninth Air Force is automatic.

Gen. Don Coyle will be vice commander to Maj. Gen. Thomas P. Gandy, commander of AFM's Ballistic Missile Control. Col. John L. Zabel will be chief of staff. Brig. Gen. Joseph E. Gill becomes deputy commander-attributed, and Col. Edward M. Hartman becomes deputy commander-attributed.

Record dead-fall distance of 14,000 ft followed by a parabolic drop of more than 3 miles was achieved last week at New Mexico's U.S. Army Test Project Kirtland, N.M., after ascent to 16,500 ft in an open-gondola balloon, also an altitude record for this type of vehicle. This altitude beyond the previous height attained by Lt. Col. David G. Simons.

Coach Gains Hold Down Revenue Growth

First class traffic surpassed for the first time; trend may produce adjustments in fare structure.

L. L. Doty

Washington—Domestic transline coach traffic expanded faster than traffic for the first time during July and threatened to make deeper cuts into a revenue growth pattern that has been steadily outstripped by a rising expense level.

The trend, which came in a head-to-jaws when coach revenue passenger miles equaled first class passenger miles for the first time (AW July 16, p. 39), is causing serious concern among airline leaders over it being accompanied by a decided decline in the monthly rate of growth in the total of all passenger traffic caused by the 12 translines.

The public's impulse of expanding coach traffic, with its lower revenue yields, at the time of a general leveling off of the rate of overall traffic growth already forced one major U.S. carrier—United—to cut the Civil Aeronautics Board to increase seats based on an average of higher load factors in 75% of first-class routes. Other carriers will follow with similar steps. And airline traffic growth returns to the levels, 15% rate forecast in 1978, chances are strong that the industry will ask for a complete overthrowing of the overall coach rate structure.

Generally, a series of moves is given for the change in U.S. air travel habits, although more observers feel it is too early to pinpoint the exact cause behind the trend. However, a large number of analysts believe an aging of the fleet, not seats, is responsible for the lack of match between coach and first class. A difference of about 10 percent was recorded on transline transports with configuration configurations substantially as responsible for a large part of the movement toward coach travel.

SPLIT Opinion

The situation brings into sharp focus a long-standing difference of opinion as to the coach share between industry leaders and members. The latter hold that a widespread expansion of coach services will attract an increasing group of a niche of mobile wealth, by virtue of its relative size, will naturally assume growth.

Industry believes that the character of most markets should determine the volume of coach service which should be provided and that passengers and seats of coach schedules will merely reflect that class status is a measure of user

most 18%. Meanwhile, total revenue passenger miles for the month rose only +3%, compared with a 15.3% monthly increase recorded in July 1978.

Here again, it could be concluded that the popularity of coach travel is not due to the desire to travel in first class comfort. On the other hand, many observers feel that as travel is moving naturally to a balance in the general economy. In such a business climate, first class traffic generally suffers severely while coach traffic appears to react less sharply.

Recession History

For example, in the recession year of 1975, overall revenue passenger miles for the translines dropped 6.5%. First class passenger miles during the year fell 4%, but coach passenger miles showed a 6% increase.

Expansion of the use of split configuration for coach travel reflected a shift in market needs, mainly responsible for the rapid growth in coach available seat miles. A Boeing 707 transport aircraft produces some 84,000 available seat miles per hour, compared with the 30,000 a Douglas DC-7 generates per hour in 1975.

No result has been a steady rise in the number of coach available seat miles in recent months as package fares go up, compared with an almost negligible climb in first class available seat miles. In fact, first-class seat miles dropped 3% in July this decade, while coach miles jumped 17% in June, 1978.

With very few exceptions, transline transports are now designed with the split class arrangement. Northwest, for example, has all its fleet-hub aircraft so designed. Delta, which operates its Convair 880 in full first-class configuration, has moved a few employees against the limit of each cabin at that aircraft.

Capacity Growth

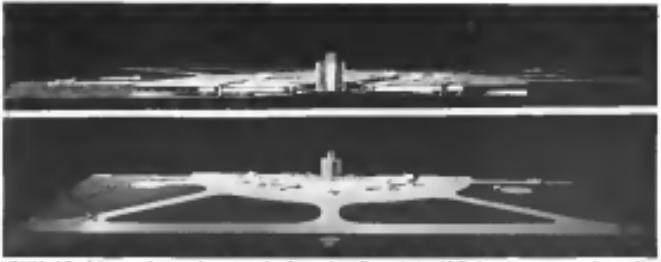
Total available seat miles for the translines rose 8.9% in July to bring about a 2.2% point drop in the overall load factor from 61.38% in July, 1978, to 62.11% last month. During July, 1978, results in Europe and Japan had registered a decline in all but four months of the period.

First class load factor in July was 54.4%, compared with 58% in the same month last year. By contrast, coach load factor in July was 73.4%

compared with a 72.9% load factor in July, 1978. Consequently, if this trend will have a serious effect on载荷 as long as the overall load factor fails to show my strength. Although it is too early to determine the full impact of this coach traffic growth on revenue, one major airline has commented that its yield in July dropped from 6.5 cents per passenger mile to approximately 4.5 cents, despite the fact that the recent

fare increase (AW July 27, p. 41) has obscured any real load factor available seat miles are measured in relationship to first class capacity. In July, each available seat miles came close to exceeding first class available seat miles for the first two. This difference of \$69 million between the two categories in July, 1978, narrowed to approximately \$16 million in July of this year.

However, such fluctuations probably will be diminished as the number of seats available seat miles are measured in relationship to first class capacity. In July, each available seat miles came close to exceeding first class available seat miles for the first two. This difference of \$69 million between the two categories in July, 1978, narrowed to approximately \$16 million in July of this year.



MODELS of Brasilia's proposed airport show extent of untagged runways (top) and half of angular airport surrounding mobile hotel control tower and plazas (bottom).

Brasilia Sees Role as S. American Air Hub

Brasilia, Brazil—A \$50 million airport and railway terminal and telecommunications processing facilities control the construction stage here. The south launch is making a sustained effort to make Brasilia the dominant air terminal of South America.

The airport's initial design, outlined in Brasilia architect Sergio Wladimir Remondini's plans, the advantages of concentration and decentralization in one terminal city. Presently, systems of the airport is a 15-story, unoccupied hotel and control tower.

Spanning 400 acres, this control spot are two underground floors for the terminal's ticket counter, passenger lounge, and control center offices, another service equipment, antenna parking areas and fire stations. Garibaldi passengers enter the terminal on the lower level and check-in those below being able to ascend to the upstairs sitting or the ramp above.

The project got under way several weeks ago when engineers and servicers drove out to a 700 ft high ridge running east and west about 12 mi from the heart of Brasilia. Next, a fleet of earth graders will strip the ridge's

surface, laying the groundworks for ten 11,000-ft paved runways.

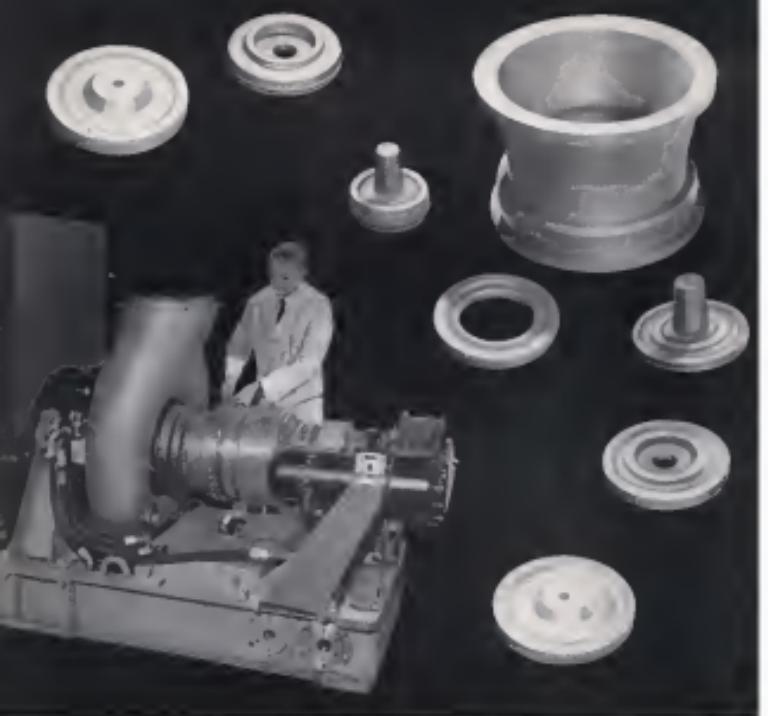
Now the town, where the takeoff end of one runway overlaps the approach end of the other, the narrowest will begin digging down to permit uplift landings and downhill landings to ensure efficient.

Concrete Design

The embankment land and control tower will be centered on a circuit about 1,800 ft in diameter. Holes cut from dead center, two stacked parking canopies will be erected. These canopies will be used for aircraft parking, cargo and passengers—personal or collective—in one of the two lower levels, and 100 ft above ground for aircraft in open canopies.

Subterranean beneath the ground surface spot will be fuel tank, oil, water for extinguishing chemicals, air compressors, auxiliary electric power, compressed air and fuel fed storage into jet engines in the waiting aircraft. Up to 30 jetlets or short connection will be available at each of Brasilia's 24 parking stations depending on what type aircraft is permanently assigned to it.

Major cultural will be accomplished in five open wings shaped like large golf tee and constructed of reinforced



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case. Both in two piece sizes—each from the metal flows in the casting between the cores. These structures will have certain parts designed to follow concentric paths through their shape with strong bonds. The outer, rounded lobes, could be used to support market gardens located on part of the engine's 2000 acres.

Bernardus specifies span, fair corner radii, and end straightening well away from the forward. On the shape near from the aircraft's centerline he would cut steps so that each downstream section should meet the first level on the same side.

He's got the aircraft tank shape, in the author's mind after a sketch of global terminals and discussions with aircraft designers, airline executives, port managers, economists and a host of other professionals concerned with urban operations. From these interviews Bernardus concluded that the problem of one group largely was created by a committee group working toward the same goal at the airport. And only a radical design change brought substantial, safe extraction needs.

Bernardus also predicts that some transports eventually will encounter situations where passengers fly in pairs to 10,000 feet. The location of these will likely be plotted on the basis of aircraft range. Using this criteria, Bernardus' "assuredly" proposes the terminal for the South African at Brakpan-Brentford International, which capital is 9,500 m.s.n.m. of Rio de Janeiro.

Although the airport can service only 24 planes at one time, Bernardus estimates that integrated facilities will eat costly ground time to 20 hours for a large jet transport. Thus the terminal could expand up to 60 planes on four. Here is how it would be done:

Car, taxi or bus approach the terminal building door in the semicircular under the roof. The rear door opens, passengers get on, one or two vehicles drop off and board to board than 100% of total arrival capacity. Each subcarrier will have its own baggage, customs and check-in counters. Total passenger walking distance to the airplane would be no more than 120 ft.

Passenger, luggage, and cargo have been loaded in conveyor, and the plane selected from a valve connected to the network of underground pipelines. Bottles, carts and boxes have been eliminated. Pass passengers consist of permanently modified ground vehicles stored at wing tanks and regular gear.

At the same time, unselected passengers are deplaning in the lower levels. Those for whom stretch is an extreme desire stop get off at the first basement where a post block all cut except through specific check points to the

hold. Departing passengers continue to the second basement to pass customs and immigration, pick up luggage and board waiting surface vehicles.

By reducing half of each plane's length at a 1.5% gradient jet turns just takeoff roll will be cut in much

as 25%. Ground, landing, aircraft will be slowed as this will apply to the terminals. Because the maximum distance and bags at the airports low. The long term flight characteristics operations at some operating U.S. airports are characterized.

South Africa's 707-344 to Have Full-Span Leading Edge Flaps

Johannesburg, South Africa—Pan American 707-344 will be equipped with full-span leading edge flaps. This aircraft has already been delivered to South African Airways. The modification will boost the transport's takeoff performance from high altitude airports or northern Africa.

In utilizing the long-range 707, Pan Am is upgrading their short-field and high-altitude takeoff capability. South African airline officials are anticipating that after completion of the conversion will follow Ghana's lead in deriving landing rights to the Union Big 707.

The 111,000 lb gross weight 707, the last of three ordered by South Africa's state-owned airways organization, is scheduled for January delivery. Some 707-344s have already been delivered to the Royal Canadian Air Force, the Royal Australian Air Force, the Royal New Zealand Air Force, and the Royal Canadian Mounted Police.

Installation of the leading edge flaps, planned to those on the Boeing 747 transports, will add about 10,000 lbs to the 707-344's permissible takeoff weight at Johannesburg Airport, which is 5,710 ft above sea level. The same would apply at Nairobi, Kenya Colony, and in Sibonay, Southern Rhodesia where elevations are 5,500 ft and 4,950 ft respectively.

These airports fall in an area around the southeastern boundaries of the Congo and could serve as execution centers if native rebellions spread.



Alitalia Promotes Olympic Games on Caravelle

Alitalia, the Italian airline, has changed markings on its 100 Caravelle jet transports to promote the theme of the 1960 Olympic Games, which open Thursday at Rome. Lettering under Rosetta-Stone figures says: "The Official Alitalia Jet for the Rome Olympic Games."

VERSATILE ECONOMICAL RELIABLE

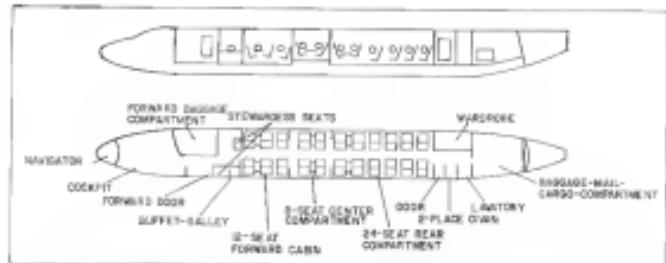
The Fairchild F-27, the brightest light in the corporate sky, not only offers new-plane speed and pressurized comfort but spanning economy and minimum maintenance as well. This distinctive, high-winged propjet, which can perform more jobs and perform them better, has been proved in thousands of flight hours. No other aircraft in its class offers more—and delivers more—than the designed-for-business F-27.

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DRAWING OF mid-size Tu-124 jet aircraft shows 41-48 feet-thick passenger section. Seats are arranged transversely on each side of the aisle. Longer than version of Tu-124 will seat 68 passengers; shortest version will carry 51-60.

Tu-124 to Have 68-Seat Capacity

Russia's new twinjet Tu-124 transport will carry as many as 68 passengers in a maximum configuration.

Additional seats are on the medium-range craft (SW 400, 15, p. 40) disclosed by Aeroflot's home repair Gosudarstvennaya Aviatsiya also mention. ST-60 w/c "transistor" configuration. Initial description of the Tu-124 showed up to the 48-60 passenger first-class version. Designated A. N. Tupolev says the Tu-124 is now in production.

Normal crew will consist of one pilot, one navigator and one steward. However, the concept has a folding chair behind the captain's seat for use by a radio operator. An instructor can be seated in a folding chair behind the navigator's position in the same.

The Tu-124's first-class configuration provides 12 seats in the forward cabin right in a round corner compartment,

and 24 in the main cabin to the rear. A dual seating two person in the rear section.

Additional seats are in pairs on each side of the aisle and fastened to large padded seats. The other four seats fit in 40 in. wide aisle between rear and second row of seats in each cabin.

Gosudarstvennaya Aviatsiya says that the Tu-124 can be quickly changed from one seating configuration to another without taking it out of service. When desired standard Tu-104A seats can be switched on the trib.

Front entrance vestibule with a baggage compartment against the rear wall is located immediately behind the cockpit. Between the rear and the forward passenger compartment is the "baffler" gate, which has a folding seat for the steward. A second entrance seat is in the forward vestibule to the right of the entrance door.

Right entrance vestibule behind the main cabin has a vestibule against the opposite wall.

A luggage-compartment in the Tu-124 is not reached from the outside through a right-side hatch.

Cabin floor safety equipment is of light-toned plastic. Lamps and without winds are enclosed in the paneling.

Albany Airport Sold; Will Be Modernized

Albany, N. Y.—Albany County Board of Supervisors unanimously voted Aug. 5 to purchase the Municipal Airport from the city of Albany. Estimated cost of the transaction is \$4,447,397, half of which will be derived from float

by a bond issue.

The county plans to take over the airport operation in September, during its year at that time to Albany County Airport.

In connection with the purchase, plans are to drastically modernize the field and its adjacent facilities—much of the building and improvement to be completed by 1962. Already in progress is the construction of a new passenger terminal and lounge to replace the obsolete facilities now shared by the airport's five scheduled carriers—Trans World Airlines, American Airlines, Eastern Air Lines and Mohawk Air Lines. Also under construction is a freight terminal, three parking garages, which will be shared by the carriers and is expected to expedite freight handling at the airport.

Plans to increase runway length—the three present runways are nearly 6,000 ft. and west, 4,300 ft., and north-south, 3,500 ft.—have been suspended.

SAS DC-8 Ingests Sea Gulls

Copenhagen—Scandinavian Airlines System Douglas DC-8 transport was grounded here for approximately 45 hr recently after bring into a rock of an estimated 100 sea gulls during a night takeoff that necessitated removal of three of the aircraft's four Pratt & Whitney JT4A-3 engines and replacement of leading edges of the wings.

After departing Copenhagen on a night flight to New York, the aircraft experienced engine trouble shortly after takeoff from the Copenhagen Airport which put into the air traffic between Denmark and Sweden. A citizen passed by purchased an emergency return to Copenhagen Airport and, once there, alerted officials in Sweden who reported engine difficulties and the aircraft appeared to be damaged, the pilot stated for approximately 1½ hr. before returning clearance to land.

Ground examination showed that signature by engine No. 2 had caused damage to inlet guide vanes, fuel nozzles and static vanes. The engine was not expected to Copenhagen for any possible damage further back.

The resulting of engine No. 3 was severely damaged. Internal damage was apparently the cause so that the engine No. 2. Engine No. 4 also sustained extensive cooling and some damage. Engine No. 1 apparently was unharmed.

Delay in repairing the aircraft was due in part to the fact that replacement engines had to be flown to Copenhagen from Stockholm. Passengers, however, were transferred to other aircraft for the flight to New York.

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RUSSIAN TURBOPROP 3-18 is framed at Lopetpolje between a C-130 Globemaster in the foreground and a C-130 Hercules in the background. The Russian plane brought in 10 Cuban troops and 51 tons of cargo and mail. Five of these planes were imported in the airlift and three flying from between Africa, Ghana and Lopetpolje was reported at 54 hr., the same as the MATS C-130.

USAF Meets New UN Airlift Requests

By Cecil Browder

Wiesbaden, Germany—U. S. Air Force, after one week break, is resuming its airlift of troops and equipment to UN-led new United Nations troops designated to play about 5,000 additional men into UN's Congo Republic including officials Katanga Province, to late this month or early September.

Three new nations—India, United Arab Republic and Senegal—agreed last week to supply troops to support UN forces in the Congo who increased their strength in explosive factor. Four other countries also represented on the new war list supplied troops earlier to the Congo aboard earlier US flights to the area.

Afghan forming is over 9,000 troops and 418,130 lb. of equipment and supplies in two weeks of massive effort UN Aug. 15, p. 32. Air Force resumed its effort on Aug. 13 when three Douglas C-133 cargo planes of the Military Air Transport Service's Provincial Wing Headquarters at Chatsworth Air Base, Florida, began moving 215 Troops, 100 horses and 14,160 lb. of equipment from Tampa to Leopoldville in Central Congo to support 2,101 Troops already in the Republic. Left

of the Tunisian troops was completed with last week.

On Aug. 15 three C-130s and five C-130s of the 122nd Air Division based at Futen Air Base, France, began moving 307 Sudanese troops and 170,000 lb. of equipment from Lopetpolje from airports in Dakar, Senegal and Juba in southern Sudan. C-130s flew into Khartoum to pick up 16 transports and 40 600 lb. of equipment. C-130s, which can carry 10,000 lb. of cargo, were used to transport 117 tons and 130,000 lb. of equipment from Juba to Leopoldville. The operation was completed on Aug. 16.

Other airlift efforts last week included:

- Aug. 15-16—Senegal and 28,000 lb. of equipment from Dakar to Khartoum aboard four C-130s to begin acquisition of 870 Irish troops in the area.
- Aug. 16—700 Moroccan troops and 120,000 lb. of equipment, including 20 vehicles in 11 C-130s from Sub Saharan Air Base, Morocco to Leopoldville, capital of Katanga Province. 500 Ethio open tanks and 100,000 lb. of equipment from Addis Ababa to Kinshasa, former Belgian military personnel in seven C-130s and 16 sorties. 600 German troops in 12 C-130s from

Conakry to Conakry. All these arrivals are scheduled to be completed early this week. Total of 2,400 Moroccans troops, 130 Thracians and 750 Germans were in the Congo before the new UN began.

- Aug. 17-18—additional Irish troops and 20,000 lb. of equipment from Dublin to Kinshasa in 24 C-130s. Schedule called for the move to be completed by Aug. 18.

Other airlift schedules being drafted last week such as UN request included the movement of 1,000 Indian troops plus an estimated amount of equipment from the United Arab Republic in 27 C-130s from Cairo; 90 Indian troops, meat, supplies, personal and 2,000 lb. of equipment from New Delhi's Palam Airfield to Leopoldville and 355 Sudanese troops and 210,000 lb. of equipment.

UN requests for aerial support were distributed through headquarters of U. S. Air Forces in Europe to the 32nd Air Division at Toulon, which retains overall operational control of the effort. MATS C-134 Provincial Wing at Chatsworth, Florida, moved 1,000 troops and supplies and 100,000 lb. from the U. S. and was originally scheduled to begin operations on Aug. 17. It has orders to remain on station indefinitely.



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Two New Airline Passenger Clubs Promote Low-Cost Insurance Plans

Low-cost life insurance for auto passengers is being promoted by the Auto Club and the Auto Passengers Assn., two new organizations that also propose to amplify the voice of auto travelers within the industry.

Answers Club and A&P couple other services—trial insurance, monthly publications, credit cards and legal wings, for example—to maximize sales. Additional insurance purchased over the counter or from traveling salesmen at an agent has no effect upon the clubs' marriage. Both are profit-making entities.

America Clark, which began advertising from its New York City headquarters in 1949, features a \$150,000 accidental death insurance policy that for \$65 a year, covers members on hospitalized and scheduled airtime during airtime in the world. No disability coverage is included.

APA policies range from \$50,000 to \$200,000 and cover most preventable losses from \$25 to \$100. Beneficiaries reflect if the insured person loses his life or is maimed. Eight agencies by a selected authority, the Military Air Transport Service, the Royal Canadian Air Transport Command or the Air Transport Command of Great Britain.

Development Party

Persons insured through APRs also reflect no fell for "government total disallowance." Disallowment sustained as a result of *actual* total returns reflect all or half of the principal sum.

— Airways Club insurance is placed with The Guardian Life Insurance Co. of America, while APA is underwritten by American Life Insurance Co., Birmingham, Ala. Tom V. Post, president of APA, also is president of American Life, which will assume the group coverage with another company.

Tickets sold to members of both clubs total an annual average \$100,000 per club, for example, paying \$1,000 a year without premium increase until it reaches \$20,000. Each year an APA ticket is purchased in force, building at an annual rate of 5% until a 75% increase has been recorded. Then the growth is halted.

Continuing previous Continental
Casualty Co., one of the largest sources
of airline passengers in the United
States, will a standard \$100,000 policy
for SIS that covers all scheduled air
and MATS flights. This policy includes
double and dismemberment coverage
similar to that offered by AFPS. A per
claim also is issued while traveling to
or from the airport in a bus, bus
terminal, airplane, airplane terminal,
airplane parking area or airplane

Premium Comparisons

Airline Passengers	Airline Personnel
Total Seats	Average Cost
\$18,000	\$15.00
75,000	37.50
200,000	50.00
150,000	75.00
200,000	100.00

Astraea Club Restaurant

Annual Sales	Annual Gross Profit
\$34,000	\$10,200
50,000	21,500
100,000	41,000
150,000	61,500

¹ Acceleration of 360 m/s², no drift, no communication.

at monitoring of congressional, Prof
Aviation Agency, and Civil Aviation
Board proceedings, study of safety
auditing and operational analysis of acci-
dent and equipment failure reports and
membership of air safety forums and
such projects.

The public should already have been to the Airway Club, now about 8 months old. From the club began TAA in its dispute with workers over who should accept the third set of jet cockpitbars. TAA projects a third point. To promote an air carrier can do his job from insurance, said the club, is like asking the crew of the Peterson Johnson flight do his job from the right field



First Fairchild F-27s for Turkish Airlines

Two Finchfield F-27 nightstop transports purchased by Turkish Airlines take off from Hagerstown, Md., on the first leg of a 3,000 mi. overnight flight to Istanbul. Airline has purchased four F-27s from Finchfield and another four from Iowa Broken Aircraft, Holliston, Mass.

ALL WE CAN OFFER THE AIR CARGO INDUSTRY IS A PRACTICAL WAY! TO MAKE MONEY!



CANADAIR CAN PROVE TO YOU THAT:

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ONE THIRD the number of Canadian Party Fourts will carry out your cargo requirements at such a profit that they will absorb all expenses incurred in the retirement transaction, plus may earn you your piston engine aircraft would have realized during these three years.

AFTER THESE THREE YEARS, the Forty Four operating profit curve will climb steeply. The difference in profit potential for the following years is substantial.

Any consideration of a specific example requires certain assumptions regarding scheduling, future rates, and load factors, but, under a representative set of conditions for a major industry—that a fleet of 35 piston powered aircraft currently being converted into cargo carriers, could be replaced and retired by a fleet of 8 Party Fourts. The above assumptions and statements are based on the unlikely premise that cargo rates will remain at present levels. If they are reduced, as seems inevitable, the situation will favor the Forty Four even more strongly.

THE FORTY FOUR. The Canadian Party Fourt, with its combination of low direct operating costs, high block speeds and large payload capacity, is the world's most economical cargo aircraft. Delivery schedules can be arranged to maximize the Forty Four into service fourteen months from contract agreement.

CANADAIR LIMITED, MONTREAL, CANADIAN DIVISION OF **GENERAL DYNAMICS**

blenders in New York City's Yankee Stadium.

The club also called for a CAB investigation of airline overbooking (AW, Aug. 15, p. 49). In a letter to Board Member Whistler Goldsmith, the club

said: "It is our feeling that if there is here no deliberate policy to overbook, your obligation should show in more instances of underbooking or overbook according to the laws of chance."

Determining What Are 'Frill' Areas Called Basic CAB-Airline Problem

NON Trade-Freight is an determining factor for both passengers & cargo. Aviation Business—understanding where to trim the line between frills and real services—in the trade—social problems confronting airlines do not overemphasize Arthur D. Lewis, president of Hawaiian Airlines believes.

Extensive deregulation does exist on some routes, Lewis told the New York Society of Security Analysts, but your planes on those routes have largely retained the same of the major territories. The Board's policy of strengthening the smaller carriers has been a good one he said, and has made it possible for the regional franchises to survive in the tradition of old regulation.

Most of the regional airlines have not prepared under the new rules, Lewis said, but when that time comes it appears that management must take action. Noting regional franchises operating profit as 1 percent of Big Four profit, Lewis made these 1945 to 1960 comparisons: Southwest, from 41% to 51%; Continental, from 41% to 51%; Northwest, from 49% to 51%; and Western from 47% to 49%.

On deregulation he has cited the growing cross passenger cargo equipment situation Lewis said, but when the transition period was passed the air lines benefited little with favorable ratings. Re-equipping with jets is much greater now.

These are having influences during a period of fuel surcharge, he noted. This can cause fares to stabilize at high price levels to continue its unregulated presence in the line. This is a learning curve, an example division as well as at the national level.

Problems such as these will continue to develop down the road, and long range traffic projections are sound, but the fundamental question of profitability of the airlines which has been declining in the non-passenger species will not fade down to the normal course of events.

Airline service, as continually upgraded, has posted equal quality of load service is improved, higher service is added, and so on special service flights jet equipment has reduced flight time

and noise and has provided more seat space for airline passengers.

Cost of some of these items that can be nevered as frills, comes right out of net profit. The industry knows how easy it is for the customer to get an arm around about services as he is about price. Lewis said, and if an airline doesn't stay competitive—even if it doesn't sell the idea of getting up a special club lounge or something for example—it business will erode.

He called for a meeting of the heads between the Board and the industry for defining a more realistic line between frills and better services.

Commenting on the CAB economic statement which recommends West Coast flights to Japan, Hawaiian Air Lines Lewis said the firm has been a contributor for the success of the DC-8. Four Douglas Aircraft Co. and is itself along an negotiating for an eventual sale of their DC-8s to acquire the recommended service. First aircraft is due October 1966.

He estimated that the West Coast service would generate annual revenue of \$17 million if it is approved. Hawaiian feels it should be identified in the market, having sold travel in Hawaii for 30 years and having an office in one of the two West Coast ports San Francisco and Los Angeles.

Intricacies with a transpacific do not seem to be too great, he opined. He stated: "We didn't feel it's necessary except United which across the ocean more blocking would be in a better position to develop business than it is found at present," Lewis said.

Other comments

• Randolph F-27 made inroads in Hawaiian's local business when pH entry by Delta Air Lines, its chief competitor. Hawaiian dropped from 70% to 51% of the local market, but the adjustment is now about over. Lewis feels it will be more difficult to catch the Canadian 40 aircraft Hawaiian has, which have 52 seats each to turn to the F-27. Lewis has a maximum of 44 seats, but nevertheless the cost per plane will be less.

• Mergers are not overall. Many may not be an answer to a specific problem," Lewis said. "But they tend to create many problems as they attempt to solve."

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it's hot
thanks to
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"There's nothing as preferable to report," says A. R. Price, Transportation Manager. "Delta's policy is to be our most effective means of getting the news while it's hot, into the hands and minds of our readers in the Miami area. We sincerely appreciate the idea, informed, and cooperative attitude of the Delta Air Freight personnel."

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Delta operates all cargo flights and in 1965 carried \$160,000,000 worth of cargo. Major cities served include Atlanta • Chicago • Cincinnati • Charlotte • Dallas • Houston • Miami • New York • New Orleans • Orlando • Philadelphia • Detroit • Memphis

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AIRLINES
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FOUR TO JAPAN

GENERAL AVIATION DIVISION OF DELTA AIR LINES

AIRLINE OBSERVER

► Trans World Airlines' plan to take delivery of its Convair 880s soon from plants let Northwest Airlines to lease the last six and others of TWA's seven Boeing 720s. Northwest Airlines has delayed production of its first two Convair 880s until July. Wall Street learns that Republic wants Convair, not TWA, to take the aircraft to Northwest and that Convair is selling only if Hughes will order six more 880s in replacement. Hughes, on the other hand, wants the 690s and is making various concessions, including price and delivery priorities, in several negotiations. Passaging is not regarded as a primary cause for Convair having a three TWA 880s on the map nothing delivered IAW Aug. 8, p. 40.

► Soviet Union has postponed an IL-14 transport to Congo Republic as a gift for Prime Minister Patrice Lumumba. Reasons given were well by the myself in London since as qualified Congolese pilot am unable for the job. Russian Ambassador N. D. Yeliseyev presented the weapons to Lumumba at conclusion of Soviet Union's first visit to Congo's airport.

► Federal Aviation Agency will accelerate a program to evaluate and select an all-weather flight and landing system. At the moment, FAA is leaning toward an airborne fire-control computer technique which the British have tested successfully with excellent results. Several U.S. aviation manufacturers also have similar developments. Tag FAA officials feel that Bell Aerospace System AN/GSN-5 pound load radio landing system has not demonstrated sufficient reliability in Atlantic City tests, and that Griffiss Reg system is on track to be a state of development to meet growing operational need for all-weather landing capability.

► Watch for more by Continental Airlines to seek new financing. Although company's net earnings improved during the first half of the year, compared with the same period last year when profit was bolstered by the sale of aircraft, Continental's latest figures show a deficit working capital position which earnings are not likely to overcome.

► Look for a clever writer like Air East Pilots Assn. to place the name of James M. Lands, former Civil Aeronautics Board chairman, in nomination for president of the union when the group opens its annual convention Nov. 14 in Miami. Officers of ALPA council in New York and Washington are urging Lands, now senior partner in a New York City law firm, to run against incumbent President Clarence N. Jones for the \$35,000-a-year post, but late last week, Lands still had not committed himself.

► Boeing Airplane Co. still has cause to no firm decision on the configuration of the proposed 727 short-range jet transport. Previous pronouncements with conflicting interests of customers, whose requirements were so varied that the initial proposed configuration has been scrapped. Classes are strong that the transoceanic version will not yet follow the development of further proposed designs.

► Japan Air Lines has launched a campaign to extend its transpacific routes to New York City. Carter's President, Spiro Agnew, has asked the Japanese government to negotiate with the U.S. on revision of the bilateral pact between the two countries that would authorize the new route.

► President Eisenhower has abolished the Air Coordinating Committee, established in 1946 to provide interagency coordination on aviation matters. Advisors of ACC have been largely replaced by Federal Aviation Agency functions. Eisenhower called for the organization of a smaller coordinating group headed by a "representative" of FAA to provide communications to the Secretary of State on international aviation matters. New group would consist of members of State Department, Defense Department, Civil Aeronautics Board and the FAA. State Department will continue to direct all foreign policy in the international aviation field and conduct all negotiations with foreign governments.

► Retirement of Gordon M. Bush as vice president-sales for Northwest Airlines marks the seventh time in the past 13 months that a top official has left the company.

SHORTLINES

► Allegheny Airlines will add the coastal Long Island, N. Y., cities, ports Hartford, Conn., Springfield, Mass., and Reading, Pa., to its present route network Sept. 1. The Eastern end area will cover through Maryland and will now include flights to and from Washington, D. C., and additional service to Boston and other New England points.

► De Havilland Aircraft Co., Ltd., has down the name Trident for its new DH-103 turboprop aircraft now in production for British European Airways.

► Delta Air Lines and North Central Airlines extended their study five weeks to include September and October discussions.

► Federal Aviation Agency signed contracts with Golden Ratio Cos., and Wallace Electric Company, Inc., last week for airborne transponders to be used in soon FAA aircraft. Total amount of the order was \$25,532. The new equipment will be installed in two Aero Commandos, two Douglas C-47s, two Douglas C-118s and a Grumman Galleon based at the National Aviation Research Experimental Center in Atlanta, Ga., N. I.

► Los Angeles International Airport Runway 7-25, has been opened for night flight use by both national and private cargo aircraft. Recent estimates of the number at 12,000 ft. is expected to lessen the noise problem and will allow aircraft to carry heavier fuel loads for longer nonstop flights. Federal Aviation Agency has added \$600,000 to its 1961 allocation for runway lengthening at San Francisco International Airport where the main runway will be extended to 9,500 ft.

► Northeast Airlines' station total revenue passenger traffic dropped 7.5% last month below July, 1959, traffic. Revenue passenger miles totaled 357,599,119 last month, compared with 369,512,260 for the same period last year.

► Trans Caribbean Airways achieved a 97.9% load factor on its New York-San Juan route last month reflecting a 50% increase in passengers carried over July, 1959. A total of 17,558 passengers were carried last month, compared with 11,610 carried in the same month last year. Revenue passenger miles increased 45% over the 17,801,000 recorded in July, 1959.

SPECIAL DELIVERY

Reliability and versatility are the heart and soul of the 'all-weather' Republic F-105 Thunderchief. >>> A vital factor of its performance is its ability to assist Army ground forces at low levels as an umbrella of close support. In addition to its prime power and "special delivery" facilities . . . the F-105, designed from the ground up for the Tactical Air Command, is advance-designed to incorporate future additions to its arsenal.



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Control tower is dominant feature of flight operations and administration building at Rome's new International Airport, near the town of Fiumicino



View of main passenger terminal emphasizes long roof covering. Building has facilities for 22 airlines.



International Airport will have two major runways, one 12,021 ft. long for jets, the other 7,799 ft. long. Site is on Tiber River.



Rome International Airport Ready to Begin Service

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most. They are thoroughly proven in the most widely used Doppler navigation systems in the Navy and Army.

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RYAN BUILDS BETTER



It is possible to weigh double its thrust. This high augmentation ratio combined with thin radiators with pure fuel/oil is possible with a flat engine like that of the large aircrafts like the B-70.

Configuration of a Mach 6 cruise aircraft generally would resemble that of the B-70 but no cockpit or canopy would be required. The aircraft would have a significant effect that has gone into that aircraft. Its wing sweep would be increased slightly for the higher speed and its large engine air duct which creates the lift increasing compression wave under the wing would have to be reshaped accordingly.

Aircraft endotherms would have turned down wing tips to further increase the lift drag also be turning the high pressure flow face the duct downward. This NASA inspired design procedure is used on the B-70. It is possible that on the Mach 4 high altitude aircraft the wing tips would be turned down permanently rather than using those adjustable wings. This is done on the B-70. The engine should be located if the fighter design were to be achieved by shortening the nacelle/wing to turn the wing tips through a 90 deg angle at the point of lengthening the landing gear.

The central tanks on the high altitude aircraft probably would be placed centered on the wing tips to keep them out of the large low pressure region created by the bending of the nacelle/exhaust exhaust. In the low ambient air pressures at 90,000 ft. and above, the engine exhaust flow will collapse so that it is several times its diameter at sea level. This enlarged exhaust stream interacts with the shock waves of the aircraft and a low pressure region is created just ahead of the engine. For maximum effectiveness and minimum ram the vertical surfaces would be moved out of the region to the wing tips.

Control Surfaces

The large delta wing and control surfaces of the B-70 are ideal for the Mach 4 high altitude cruise aircraft. Minimum useful wing area is provided by the delta planform and the fact that the transonic flow is up on the control surfaces rather than down as it is on a conventional airfoil section configures.

Performance predictions for the Mach 4 high altitude vehicle begin with a weight breakdown and an estimate of total aircraft gross weight and external dimensions.

Path conservative weight breakdown on a third of the air Mach 4 aircraft designed for low massaging loads and a maximum dynamic pressure of 400 psf (700 mph at sea level) would yield 20% of the remaining gross weight to structure, 50% of the maximum

wing loadings on the highly stressed B-70 which takes off at more than 500,000 lb., fly very better than 700 psf at maximum weight to around 60 psf at landing.

Powerplant utilization would consist of two Bristol 185 afterburning turbojets and four Marauder 2043 engines. The two engines would each weigh 3,000 to 3,300 lb. each, the afterburner, and the engines would weigh in the neighborhood of 1,200 lb. each to bring the total powerplant weight up to about 10,000 lb. or 15% of the total weight as specified. A reduction in total engine weight could be achieved if two larger engines could be used, but

LUNAR AND PLANETARY COMMUNICATION



RECEPTION This B-70 aircraft receives communications from the moon. The receiver unit in the nose is used in this mode to receive signals emanating from the spacecraft.

TRANSMISSION This B-70 aircraft transmits signals from the receiver unit in the nose to the moon. The transmitter unit in the nose is used in this mode to transmit signals to the B-70 aircraft.

SENIOR RESEARCH SPECIALISTS

New opportunities involving advanced research and development projects are now open at JPL in the Laboratory's Data Communications Division for engineers and scientists capable of maintaining a high level of technical responsibility.

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Several openings also exist for supervisors of Research and Advanced Development Projects performed by industry for JPL.

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The Convair F-106 sets record as world's fastest jet aircraft...

powered by a Pratt & Whitney Aircraft J-75 jet engine

At Edwards Air Force Base on December 15, 1959, the F-106 all-weather interceptor roared to a new world speed record of 1,525.95 miles per hour. Flying a straightaway course at an altitude of 40,000 feet, it bettered the previous official world mark by 122 miles per hour.

The Air Force F-106 has also demonstrated that it has low-level striking power. At elevations of 50 to 300 feet, under most adverse conditions, the F-106 averaged 700 miles an hour in a 300-mile flight from Edwards Air Force Base.

PRATT & WHITNEY AIRCRAFT

East Hartford, Connecticut
A DIVISION OF UNITED AIRCRAFT CORPORATION



engines of this size have not been flown to date.

The adequacy of an aircraft having the gross weight, weight distribution, internal dimensions, wing area and power plant established can be determined at a rough manner by calculating at flight conditions to see if there is enough thrust available to overcome drag and feel the wing will support the aircraft.

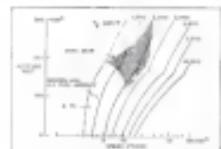
The check on the wing is needed only at maximum altitude because during the climb the aircraft is flown at the minimum dynamic pressure that the structure will stand, which would be 400 psf. Dynamic pressure depends solely on the air density, or flight altitude, and the aircraft velocity. As the altitude is increased and the air density lowered, the flight speed can be increased. This increase in speed with increasing altitude can go on only as long as the aircraft does not exceed the critical speed of Mach 4 and the wing remains effective and does not stall out.

Wing Effectiveness

Effectiveness of the wing is determined by dividing the wing loading by the operating lift coefficient. This procedure gives the dynamic pressure at which the wing will stall and will not support level flight. The operating lift coefficient for the Mach 4 aircraft will be about 0.08 because this corresponds to the angle of attack that produces the best lift/drag ratio. The angle of attack must be held if maximum range is to be achieved.

The maximum altitude at which an aircraft can begin to stall is the one at which the resulting dynamic pressure equals the reduced dynamic pressure for the structure. This occurs at 90,000 ft for the hypothetical Mach 4 aircraft when the wing loading is 72 psf after climb, the operating lift coefficient is 0.08 and the speed is Mach 4.

During cruise the Mach number and angle of attack for best lift/drag are



EQUILIBRIUM drag coefficients. If a check from the trailing edge, which will be generated on the B-70 during cruise as shown here along with the range of temperatures which must be reflected by the Dyn-Sens detectors and the equilibrium temperature for say Mach 4 high altitude aircraft.

AIRPORT WEEK, August 22, 1968



Positive Visual Inspection

Only the NEW CHERRYLOCK AIRCRAFT RIVETS Give you ALL these advantages

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- Positive Clamp-up
- Wide Grip Range
- Complete Hole Fill
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No aircraft rivet can match the features offered in the New Cherrylock® "2000" Series rivet.

Frozen high sheet clamp-up—this rivet can be used for several material thicknesses, reducing stock requirements and lowering cost. Complete hole fill even in reverse holes, with uniform head seating, wide grip range and mechanically locked stem.

Easy, positive visual inspection—after the rivet is installed—is quick proofing.

guaranteed by grip length markings on the head. Cherrylock rivets are installed with existing Cherry installation tools to give you better tooling at lower cost.

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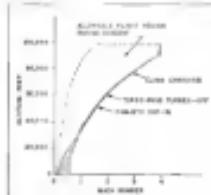
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SPACIATORS IN AUTOMOTIVE INDUSTRY,
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would have to be achieved so the net draft weight would have to go up by about 100,000 lb to carry enough fuel to extend the range to 5,000 mi.

Temperature control on the Mach-4 aircraft would be a scope problem, and a significant amount of the 17% of the gross weight devoted to equipment and systems would have to be spent in a cooling system. From a weight and simplicity standpoint, one of the more efficient cooling systems is to carry about 4,000 lb. of ice water and pump it through all of the areas which heat up during flight. This is the method used in the pilot's pressurized cockpit, engine, and remanufactured equipment bays, fuel tanks, which probably would be partially protected by insulation, and possible parts of the fuselage subject to severe temperatures. Water has a high heat of vaporization, and 4,000 lb. would be sufficient for the cooling requirement of the Mach-4 aircraft if it was transformed into steam and exhausted from the nose of the aircraft.

Flight of this aircraft will be no problem because it will have better than 30,000 lb. of thrust available to propel its 60,000 lb. Landing will also be simple compared with the landing problems of even high performance assault today because of its low wing loading, near 29 psf when all of its fuel has been expended.

Primes area of concern as far as the power available from the engine is concerned is adequate power for rapid

acceleration so that an excessive amount of fuel is not consumed in reaching cruise altitude. The thrust available at any given altitude is the fuel level uncorrected for density. This can be determined by dividing the gross weight, which is equal to the LBF, by the lift/drag ratio. If good climb and acceleration is required, fuel sense

Consequently, estimates of the performance of the Basalt helicopter and the Magmaray range indicate that the engine's capabilities described would enable the aircraft to fly around and then penetrate the necessary course threat with some of the range left down. Preliminary analysis of the results would indicate only two of the threats could be avoided.

Massive usage of the 50,000 lb. aircraft described here would be well under 5,000 lbs. and probably not exceed 10,000 lbs. of specific fuel consumption for the engine. The engine is assumed to be about 2.3 lbs of fuel per pound of thrust per hour.

HOTSHOT



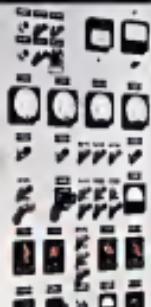
Westinghouse Capacitive Storage System for McDonnell's new Hotshot Wind Tunnel Delivers 7,000,000 Joules in 3 Milliseconds with a Peak Current of 4,000,000 Amperes

2

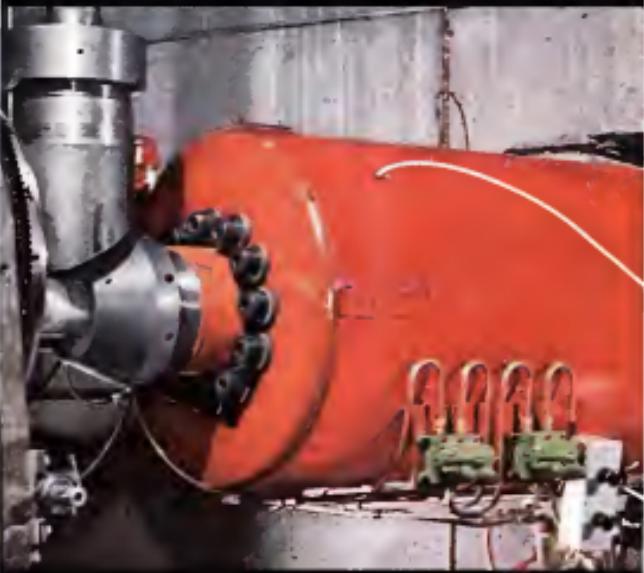
The Hot Stuff® High Voltage coil assembly is located only at this research facility. Westinghouse's unique resistor—combined with a variable capacitor—regulates voltage—charges capacitor bank to predetermined level.

**1**

The Trigger Generator's electrical signal, generated by the hot wire, initiates the tremendous flow of energy for new fly-by-wire flight control system.

**3**

The Current-Mileage-designed control conductor for delivers arc energy to compressed air, raising pressures and temperatures several orders of magnitude. Air explodes into the tunnel wind-tube at speeds of aircraft and reaches altitudes above 100,000 feet.

**1 2****3****4****5**

Ind. Air explodes into the tunnel wind-tube at speeds of aircraft and reaches altitudes above 100,000 feet.

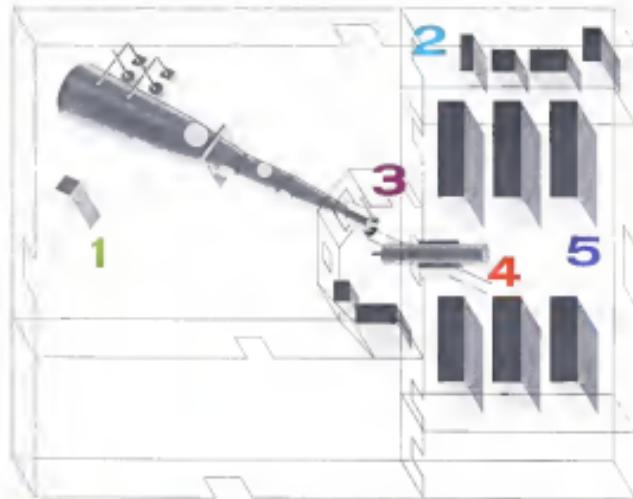
The Supply Lines 230 separate-like cables converge in rear of capsule to deliver peak currents to 10,000,000 Amperes.

4

The Arrestor Twenty-nine Westinghouse carbon-bolt rods, each containing 80 fused capacitors, are housed together in groups of ten, and connected by coaxial cables to the collector.

5

Within six months after receipt of contract Westinghouse delivered and installed the capacitive energy storage system for McDonnell Aircraft Corporation's new "Hotshot" wind tunnel at St. Louis. This facility is now providing vital data at a small fraction of the cost of actual flight testing. This same capability for quickly providing reliable equipment can help you solve your aerospace R & D problems. Contact your Westinghouse sales engineer. Or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. You can be sure... if it's Westinghouse.



5. Twenty new nodes in various locations will be added to the system to increase its coverage and reliability. That will allow the system to handle impulse power of up to 500 watts. David Cawley, president of Hoover Dam, believes that the expanded system will allow for a growth capability to 30,000-5000 users.

Westinghouse



Side view of the second prototype Westland Westminster shows the robust powerplant nacelles mounted between the fixed wings and the main landing gear.



Westland Westminster With Six-Bleded Rotor

Second prototype Wintonair is powered by a pair of Napier Duke 219 turboshaft engines mounted in the ultra-top. With fuselage tilted over, the Wintonair can be used for high-speed airships.



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Report - 2014 Annual Report



North American A3J Vigilante Mach 2 all-weather attack aircraft is hoisted on board USS Saratoga at Mayport, Fla., for touch-down carrier trials. Trials were conducted on Atlantic Ocean 125 mi. off Mayport. Vertical stabilizer weights not shown are added.

A3J Vigilante Lands, Takes Off From USS Saratoga

Fliers from Naval Av Test Center at Pensacola River, Fla., recently flew the North American A3J attack aircraft during carrier suitability trials conducted off the coast of Florida. At left A3J No. 144697 is being transported off the USS Saratoga flight deck. Below the A3J is about to touch down on the carrier for a standard go landing. Note lower speed leader panel (AW June 20, p. 131) extended instead of flap. The A3J is reported to be ready for fleet assignment next year. Towing and spotting capabilities were checked during the trials.

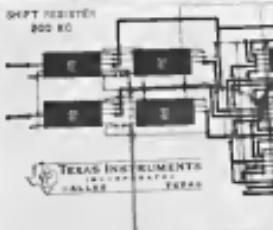


Stress catapult on USS Saratoga's 1,600 ft. flight deck is about to launch the A3J. The aircraft made 10 landings and 14 landing overflights and several touch-and-go landings during the trials. Three Navy pilots participated in the carrier flight tests.

In Carrier Suitability Trials Off Florida Coast

Flaps down and landing edges drooped, A3J under touch-and-go goes over USS Saratoga's deck. Stress landing system is in foreground.





TI is now developing revolutionary missile electronics using SOLID CIRCUIT® semiconductor networks

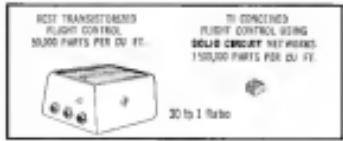
In 1958, four years ahead of industry's expectations, Texas Instruments introduced solid circuit semiconductor networks—a new concept for increasing the function of a conductor circuit on a single-crystal silicon wafer as large as the head of a nail.

Now, system designers in TI's Apparatus division are applying this concept to digital flight control problems—and the result is maximum 30-to-one size reduction over the highest-density packaging previously available. Equally important is an 80% reduction in the number of solder joints—a major cause of electronic equipment failure. Apparatus division experience is thus now being translated that nearly half of today's military electronics, ground or airborne systems, can make practical, beneficial use of Solid Circuit networks.

Other reliability gains attributed to this new design concept evolve from simplified production, test and process control. Equipment fabrication maps already have been reduced to one-tenth those needed for the same circuit functions using conventional components. Where unprecedented long-term reliability is required such as in space flight, the weight

and space consumed by conventional components can now be devoted to circuit redundancy and self-healing techniques. And in microcircuits where design trade-offs and weight savings mean that fuel load can be increased without displacing valuable instrumentation.

The application of this advanced technology is another example showing how TI puts new concepts to work in military electronic systems. For more information on TI capabilities, send for booklet "Missile Electronic Systems" or contact SERVICE ENGINEERING.



A Division of Texas Instruments

TEXAS



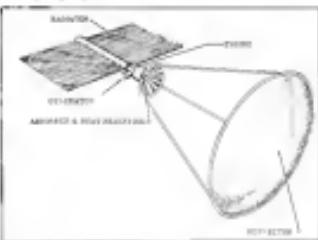
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EXPERIMENTAL solar-dynamic power system developed by WADD engineers uses solar energy to warm molten salt to drive steam turbines. Much of solar-dynamic system weight comes from Stirling reciprocating engine (AVW June 12, 1960, p. 250). In solar generator, a heat exchanger is being developed by Allis-Chalmers of GM. Isolated coated reflective foils are used to limit hydrogen welding residue.



Air Force Space Vehicle Power Program: Part II

Megawatt Power Levels Sought for Space

By Philip J. Klass

Washington—Air Force applied its much-proven space vehicle power technology in placing primary emphasis on a dynamic type version for the upper end of the power spectrum.

Three high-level electric power systems, using rotating electrical generators driven by nuclear or magnetoplane heat engines powered by solar, nuclear or chemical energy, are intended to serve needs of space vehicles employing electric propulsion and for communications, early warning and communication satellite orbits.

These high-level electric power systems, using rotating electrical generators driven by nuclear or magnetoplane heat engines powered by solar, nuclear or chemical energy, are intended to serve needs of space vehicles employing electric propulsion and for communications, early warning and communication satellite orbits.

During the coming year, Air Force hopes to initiate a parametric study of a nuclear-dynamic system capable of supplying 1.5 megawatts, a power level which it is expected to be required by space vehicles in the 1970-71 period according to Maj. William Alexander. Alexander is in charge of power in office of Director of Research and Technology, Air Force Headquarters.

With state-of-the-art components such as solar cells, thermoelectric and thermionic converters (AVW Aug. 15 p. 85), the dynamic system is to be built around an Allis-Chalmers nuclear heat source connected with Allis-Chalmers was directed toward a three-loop system, with one loop using air working fluid to cool heat reactor heat, another to drive the turbine, and a third to exchange heat between the other two.

Subsequently, WADD awarded Air Research another contract for a single-loop system using a single working fluid, air, however, and more modest. But dynamic system will generate electric power at least as desired using either air or gas, while most dynamic converters have low level dc outputs. For long-term survival radiation and nuclear sections are the logical energy sources with chemical energy likely to refresh short-duration intervals. Project studies indicate that

When National Aerospace and Space Administration decided to open up development of a 10-kw nuclear dynamic system and contracted the

Six Styroflex® Coaxial Cables on One Tower

...feed antennas for WIIC (TV) and WWSW-FM in Pittsburgh!

A whole "family" of six Mytronix® coaxial cables is currently in use on a single 812-foot tower in Pittsburgh, Pa. The six cable runs act as transmission lines for television station WQED and for radio station WPSU-FM.

This 60° "Y" directional coupler serves two main functions in terminating in the east antenna arms. One of them is absorbing at the transmitter output of 98 kW Westerly Power, the other handles a transmitter output of 42.8 Kilowatts Aural Power. A pair of 3dB splitters are connected after the 11.0W auxiliary transmitter and before each of the two auxiliary antennas. Another 3dB cable is used as the primary antenna lead for 100MHz FM, with a 1/2" cable acting as a shielded line for the station.



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Sherry, head of WADDP's Flight Vi-
bride Project Branch.

Complete Spar system, including nacelle but excluding shielding, is expected to weigh between 7,400 and 10,000 lb., or 8-10 lb./lb. The generator and turbine will be fabricated in a single shaft. Potassium vapor exhausting from the turbine at a temperature of around 1,100°F will be used for gas cooler "cooling." Design of a generator which will operate reliably at such temperatures presents a challenging problem.

Generator will supply three-phase 115/200 volt power at a frequency of 3,200 cps. Voltage will be controlled to within 3% and frequency to within 5%, according to present plans.

Project Timetable

Present trouble calls for completion of the change chart and preparing experimental work by the fall of 1961. Preliminary testing of the resulting gear carrier portion of the system is scheduled for the fall of 1962, followed the next summer by preliminary tests on the reactor. A fully feasible operating system is slated to be ready for tests in the spring of 1965.

Current Air Force and NASA programs for nuclear-powered systems have focused attention on a possible radiation hazard that might occur when a solid boron reactor reaches the atmospheric end of its life.

In the lower kilowatt range of the power spectrum, solar dynamic systems appear to have the weight edge over nuclear dynamic systems. There is no need for heavy shielding to protect the satellite payload from nuclear radiation, nor is there any recent radiation evidence.

But solar dynamic systems require some means for storing solar energy for operation during periods when the vehicle is shaded and energy must be provided to position the solar energy collector so that it is always aimed at the sun.

Current WADD programs as well as other research interests include the following:
• Solar Power Unit Development (SPUD), under contract with Thermacore Worldwide, with an output of 1 kWe, has successfully operated for more than 2,000 hr. This system is a Baseline cycle system employing one or more as the working fluid. Programs currently are conducted following NASA contract award to Thompson Ramo Worlwide for a 5 kWe solar dynamic system known as Sunflower (PAW Apr 25 p. 18).

• Advanced solar dynamic system, with output of 15 kW, also a Rankine cycle

Major Contractors

USAF Applied Research Programs in Space Vehicle Power

Company	Photocells (Solar Cells)	Photovoltaic Labeled Systems	Photovoltaic Electronics	Solarized Generators	Poly Cells	Silicon	Silicon-Polymer	Silicon-Silicate	Silicon-Epoxy	Silicon Compounds	Siliconized Epoxides	Siliconized
All Research						X						
Amesjet Control						X						
Altiron (See Materic)							X					
Area												X
Bell Telephone Co.												X
General Peripherals												X
Bellco						X						
Brown Optical Systems	X	X										X
General Airlines (GARL)						X						
General Motors	X	X	X	X								
General High Voltage												X
Kalina Industries						X						
Maxline Medical (MAXL)						X						
Merchandise						X						
Perches Electronics						X						
Area 4 Photo												X
Water Glass												X
National Gypsum						X						
Polymer-Max						X						
Radio Corp. of Amer	X	X	X			X						X
Radio Rec. Labo						X						
Resistor Transistor												
Standard Research Inst						X						
Sentient							X	X	X	X		
Technicon Operations	X					-						
Theological Semin												
Westinghouse												
Westinghouse Panels	X	X					X					X

¹ Assim como a maioria, no Reino Unido.

Information about the study procedures

Journal of Health Politics, Policy and Law, Vol. 33, No. 3, June 2008
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How do you make correct decisions in controlling our defense forces in directing air traffic in managing a world-wide organization? Modern society increasingly relies on vast information processing systems, composed of men and machines, to help make these decisions. To study man-machine systems, we are building a new kind of general purpose simulation facility. Systems Simulation Research Laboratory. Its central element will be a very large digital computer. The laboratory will be used to search for principles for allocating tasks to men and machines, develop methods of modeling and controlling large, complex organizations. Our objective is to develop a body of basic knowledge about principles that affect the design of these systems.

SYSTEM DEVELOPMENT CORPORATION. A non-profit scientific organization developing large scale computer based simulation and control systems. Staff openings at Ladd, New Jersey and Santa Monica, California.



thermoelectric systems, it under development at Sundstrand Turbo Division of Sundstrand Corp. System will employ rubidium as the working medium, operating at a temperature of about 1,200°F. At this temperature, there will be a 47-ft diameter folding metal parabolic reflector.

Present contract covers only a design study but WADD hopes to extend the contract to call for fabrication of a hypothesized model with delivery late next year or early in 1962. System will include thermal storage provisions in the form of lithium hydroxide with a sodium fluoride regenerator.

■ **String-cylinder solar system**, capable of delivering 1-kw, is under development by Allison Division of General Motors. The string cylinder uses a reciprocating two-gear engine which has relatively high efficiency, about 50%. In the power range of 1-5 kw, the string cylinder may be lighter in weight than the flat-panel system. The Allison system will use boron-glass as the working medium. WADD is financing engine development, while the company is funding development of a solar collector. System construction and performance tests are scheduled for this year.

■ **Solar power system study**, covering power of 1,200 kw, under contract to Allis-Chalmers, is intended to provide a mathematical model describing solar dynamic system operation. This will permit use of digital computers in optimizing design parameters of future systems for specific power outputs and application. The company also is carrying out investigations of collectors and boilers for solar dynamic systems, work that is expected to continue during the coming year.

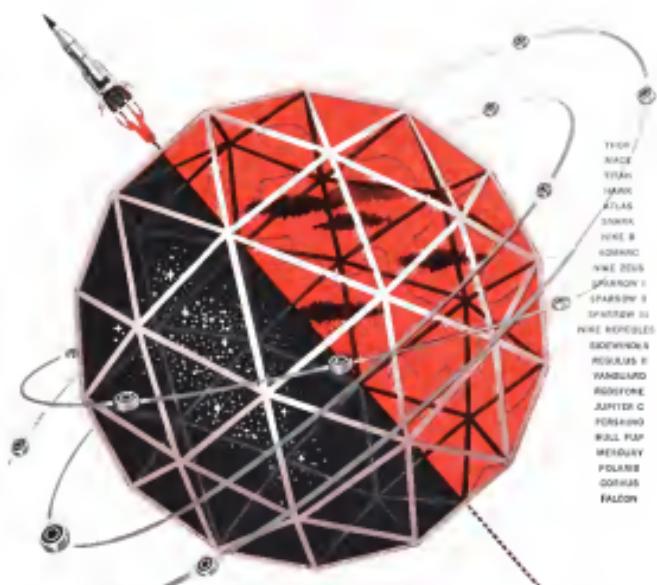
■ **Experimental solar test unit**, an in-house program of WADD referred to internally as "minitests" with solar dynamic system operation, was constructed from available hardware and test water as the working medium. System will also permit evaluation of new solar dynamic system components.

Although thermoelectric systems in which thermal energy is used to vaporize the working medium have long been used for earth-based power generation, their application to space and its unique environment raises some fundamental problems about which little is known.

In the terrestrial TEC environment, vapor bubbles rise to the top of a pool in a boiler providing a homogeneous pool of vapor which supplies the reboiling as reciprocating heat input. But in a strong space environment, the vaporization process is radically altered, as WADD finds in a Corvair C-311B flying a broad swing trajectory. Here deionized

The vapor condensation process also is altered radically in a strong electric field.

Memos made by WADD of the oper-



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In delicately precise instruments, parts must resist to relatively small rotary forces. Here, bearing torque is the highly critical factor. Separation selection, bearing finish and critically clean assembly areas are extremely important.

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present day modern assembly areas approach fantastic levels of cleanliness.

An everyday example of NID's contribution to improved instrument sensitivity can be found in the Smithsonian Institution's related Moon Circles. These vastly important instruments are especially tracking both U.S. and foreign satellite instruments in time determinations of 1 millisecond... and better!

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MEMO TO ROBERT:

I am in receipt of your recent letter in which you say in part:

When I got the pictures that you sent me I was very happy and brought them to school with me and on my way home I had a fight with another kid. I went outside and the pictures on the ground and while I was fighting somebody took the pictures I swear on the Bible that is the truth so could you please send me some more pictures of Kaman Helicopters.

Your new set of pictures is on the way. Robert, I hope that as you grow older and become a young man you will keep your interest in helicopters and aviation in general. When you and the boys of your generation take over the responsibility of running our great country, I hope you will find it strong and prosperous. Our National Defense effort right now is dedicated to that purpose, and with boys like you who are willing to fight for what is right, we know that our country will be in safe hands in the future.

Sincerely,

IN
NATIONAL
DEFENSE

KAMAN
IS
PART
OF
THE
PLAN

ation of a simple boiler and condenser unit rig installed in the C-315I showed a number of unusual phenomena. When an aircraft passes the point of zero in its Keplerian trajectory, which occurs at about 12,150 ft, the bubbles in the liquid medium increase in size. Instead of rising to the top of the liquid, the bubbles tend to roll down the vessel. When vapor bubbles come into physical contact, they no longer coalesce (unite) into a single bubble but instead cling together like a bunch of grapes. Vapor pressure in the boiler fluctuates and vapor flow is greatly increased, even halted in some instances.

WADD hopes to continue these experiments in a KDC-115 which will be able to provide longer and lighter flight duration (10-15 sec.). However, major perturbations in airplane trajectory may interfere with observations and even roll the aircraft. For this reason, WADD plans a series of low altitude experiments in a missile. At Farness Bunting's solid propellant booster, roughly half the launch vehicle. Through Rane Worldwide, under contract to study reentry/spaceplane design for the Space Shuttle cycle dynamics system, will collaborate.

Many of the solar dynamic and solar static systems programs necessarily include thermal insulation designs with various radiators, shields, etc. Although the WADD has several programs under way aimed at developing techniques required for thermal components that could find use in a number of different types of systems, one project is shown here. It consists of heat exchangers that interface with a nuclear reactor heat source, and an radiator waste heat into space.

Solar collector/handshields are under investigation by Electro-Optical Systems Inc., Pasadena, Calif., with an objective to generate a thermodynamic model (equation) which defines all of the geometrical, optical and heat transfer parameters that determine efficiency of the collector in concentrating solar energy. With such parameter designs of collectors for specific systems can data be performed on digital computers.

Thermal energy storage systems, in which heat is absorbed as material changes from solid to a liquid form, are being investigated by several organizations. Lockheed Corp. is investigating casting materials and techniques while Cellite Chemical Corp. is attempting to synthesis suitable zinc materials, including reversible chemical reactions which absorb heat in the process of decomposition. WADD also plans to conduct a parallel effort with a European company at currently unnamed location.

Space modules, specifically designed to operate in a strong magnetic environment developed by Electro-Optical Systems Inc., Dana will be based upon a

mixed tube-massay condenser in which part of the fluid is resublimed.

Where space schedule permits, experiments are short-term, or for peak load assignments beyond the power levels of existing chemical storage systems. These employ hydrazine, liquid or solid propellant type fuels for the most part, driving either turbines or reciprocating engines. Current WADD programs:

- Long-duration auxiliary power unit, intended to fill the gap between batteries and long-lived nuclear/vascular units, is designed to burn hydrogen and oxygen stoichiometrically, to achieve 100% fuel combustion. Aluminum breeder cell serve in the working medium, being heated by the combustion of oxygen and hydrogen to a temperature of about 1,300° F. This is a test. Small steam turbine which will undergo study and development for the 5-kw rating, will fabricate a working heat-shield model. Design objective is a 100 kw service life with fuel consumption of about 2 lb per kw-hour-hour original, roughly one-quarter the fuel consumption attainable at previous non-stoichiometric combustion systems.

- Short-duration chemical power unit, designed to deliver 10 kw at 85% power factor 181 sec. and 15 gpm by turbine power of 2,900 rpm, will use magnetohydrodynamic (MHD) generators to drive a secondary thermoelectric generator, under development by Standard Turbine, to have operating hours of 41 to 70. This is a specific fuel consumption of 1.6 lb/kw-hr. The 51.7 million contract started from an unsolicited proposal.
- Disc and sorbent turbines, low-speed, low-pressure devices which can be driven from gas cycle units or low horsepower nuclear/boiler powered stations employing closed-loop Rankine or vapor cycle, being investigated by Standard Turbine to determine the best manner of their use efficiencies and possible requirements for future habitat efficiency.
- Liquid fuel gas generators, capable of supplying hot gases for solar conversion

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KLIxon TYPE AT1-1

Here is the first truly subminiature, precision calibrated switch that is hermetically sealed in MIL-S-883B. Prior to sealing, the AT1-1 is especially processed and tested with a dry, inert gas to insure reliability for "dry circuit" applications. Hermetic sealing, which insures complete protection against moisture, dust and vibration, is the answer to difficult sealing problems.

This new "Klixon" switch is designed around a unique, "W" shape, springing element to meet stringent shock and vibration requirements. When switch reliability, space and weight savings are required, this switch outperforms any other switch in its class.

Here is the answer to a designer's prayer for the smallest, lightest,最可靠的微小开关。Write for further detail on various means of mounting and actuation.



SPECIFICATIONS	
of KLIxon Type AT1-1	
Actuating force	0 to 4 oz
Release force	1 to 4 oz
Position	100° approx
Overtravel	± 20° approx
Measured differential	100° approx
Min. open (10 cycles)	100 ms
Weight008 lbs
Act. temp. range	-10° to 125°
Cont. temp. range	-5° to 125°
Contact rating	20° approx
Vibration resistance	± 1 g
Shock resistance	50 g

Special Products: Klixon® Micro繼电器, Miniature Over-Speed Relays, Pressure Sensors, Micro-Operating Relays, Thermometers, Precision Switches, Circuit Breakers

er turbine generator will be manufactured by Thompson Ramo Wooldridge under a fixed price contract. Gas-pump generators, advanced liquid propellants, ignition and flow gas monitor techniques required to produce clean[™] gas.

+ integrated power and cooling unit for use with Dynalox type usually using liquid hydrogen as a cold source medium and the fuel which would power a turbine generator, is being investigated by Walter Kidde & Co. under a recently awarded WADD contract. A conduct liquid hydrogen has twice the capacity of water, which it contains three times as much energy per pound as hydrogen.

The electrostatic generator, one of the earliest methods of generating electricity, is being investigated by Air Force because at extremely high voltage, low current output matches the needs of electric propulsion systems. Several companies are investigating electrostatic generators for possible space vehicle application either under Air Force grants or with company funds. WADD contracts is sponsoring investigation at Cleveland Peacock Industries, Goodrich High Voltage Laboratories, and Westinghouse Electric. Goodrich High Voltage/Atmospheric contact cells for formation of a feasibility model for delivery late in 1961.

Other Programs

Other WADD programs in the area of ionizing radiations for space vehicle use include the following:

- Vanuca-cooled motor, capable of operating without air blast cooling, relying solely upon radiation for cooling, will be developed by Thompson Ramo Wooldridge under a month awarded contract. Present motor system can operate at ambient temperature of 270°C if forced-air cooled. New motor for same motor to be designed to operate with three keepers of around 1,000°C, with forced air having greater efficiencies and knowledge design losses.

- Long-life motor, designed to operate for a period of a year or more without maintenance or lubrication, will be developed by Westinghouse Electric.

- Long-life generator scheduled. In particular, health has operation for a year or more in space environment is under development by Jack & Heinz, Inc. To achieve required reliability, the generator will use no bearing, mechanical insulation or bearings. Program is aiming for two basic types of generators: one to operate at 6,000 rpm and 250V term pressure, the other at 24,000 rpm and 100V.

Amongst our Air Force's programs of applied research in energy conversion are projects involving the fusion and the fission techniques for produc-

Propellant Briefs from Gallery Chemical Company

Nitrogen Perchlorate: Forming New Solid Oxidizer—Gallery is now producing nitrogen perchlorate (NO₂ClO₄) on a small scale for use in propellant development. Increased production will follow as application develops.

Specific impulses, with shifting equilibrium, 1000 to 14.7 psia, are shown to compare nitrogen perchlorate with ammonium perchlorate.

End	IP with NO ₂ ClO ₄	IP with NH ₄ ClO ₄
H ₂	348	287
BH ₃	346	300
AH ₃	309	302
BH ₄	302	285
NH ₃	295	365
UDMH	284	259
C ₂ N ₂	276	258
CH ₄	278	252

Nitrogen perchlorate is extremely stable to about 100°C, has a solid density of 2.22 g/cc and a RI = +8 Kast/mole (298°K). Vapor pressure is less than 0.5 mm Hg at 70°F. Reacts readily with water. Not shock sensitive when pure.

Nitramine perchlorate may prove useful in solid and hybrid rocket motors and in explosives. It can be used as a starting agent and possibly as an intermediate in other chemical syntheses.

RWPA for Aviation C-200.

New Fuel for Air Force: Pentaborane (B₅H₉)—Gallery is now modifying the Government-owned plant in Monrovia, California to produce pentaborane under a \$5-million Air Force contract.

Pentaborane production began this summer for Air Force requirements only. At the winter, at least, no pentaborane will be available for commercial development.

Potential of pentaborane as a fuel is evident in its high heat of combustion—29,000 BTU/lb—and in high specific impulse with correctly used oxidizers.

RWPA for Aviation C-200.

R and D on Fuels and Propellants—We have capabilities for subcontract research for defense programs in the propellants, explosive, energy storage, explosive, and cause manufacturing areas. We also have proven development capabilities in these areas. Such diversification and technical versatility may help you. For information or technical service, write Defense Product Dept., Gallery Chemical Company, P.O. Box 11145, Pittsburgh 37, Pennsylvania.



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Manager, Washington Office
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ring clarity-brightness and plasma generation.

For space vehicles, batteries are a compact source of strong electric power desired by solo crew crews for telephones etc when the vehicle is isolated from the sun, and/or to handle a peak load beyond the steady state capacity of the vehicle's power sources. But batteries are relatively heavy and/or short-lived. An other shortcoming of certain types is the inability to withstand repeated cycles of deep discharge. WADD's battery research program includes the following: • Silver-zinc batteries with very high initial output per gram have the disadvantage of self-discharge, their discharge rate is too rapid. Furthermore, a common and reported short discharge. Principal causes of these shortcomings are believed to be excessive gassing at the electrodes and migration of silver and zinc free ions through the separator. Under a recently awarded contract Deltco will investigate these problems in an effort to develop techniques which will enable silver-zinc batteries to withstand thousands of cycles of discharge to 60% below rated voltage compared with the 17% discharge limitation that exists at present.

• Nickel-cadmium batteries can withstand repeated cycles of deep discharge, but at a heavier than the silver-zinc batteries. Research work with Cadmium 103 tracer cells for basic investigation of techniques for reducing battery weight, with the objective of achieving a figure of 24 with low pressure, compressed with approximately 17 with no pressure obtainable.

• New cathode-anode couples for secondary batteries, which may greatly slash battery weight, perhaps providing several hundred watt hours per pound, will be investigated by Radio Corporation of America under a recently awarded WADD contract. Studies at oxygen rich anodes, which will eliminate sulfide formation of figures as high as 100 watt hours per pound, but have been found to be extremely sensitive, suitable non-corrosive electrolytes must be developed before their use can be used.

To assist space vehicle contractors in selecting the best suitable batteries for their particular needs, WADD recently concluded with Clegg Electric an open-source battery test facility in Dayton, which will function as a sort of "Consumer Reports" operation. Under a DOD operation, the contractor will test all available batteries available to industry. Contractors who will conduct post-mission or failed batteries in an effort to determine basic cause for failure and potential improvement by the manufacturer.

Under WADD contract, the Massachusetts Institute of Technology is con-

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gotta
have
faith!*

TEL. 4010 is a wonderful thing in business—before or religion. But an engineer's job involves measuring physical quantities, and faith in these measurements is only possible when good, reliable proof. We make accurate, dependable calibrators to furnish this proof in the case of flow, pressure flow, liquid level, cryogenic flow, and more.

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SILICONE NEWS from Dow Corning



Photo courtesy Federal Express & Airplane Corporation

Seals Where Others Failed

Flexible, easily applied sealant

F-2701AE Neoprene Consolidated Aviation, which serves Alaska and Canada. Tests started when temperatures dropped below -50°F. Seal ceased to stick closed. After the doors were opened, seals were so brittle the doors couldn't be closed.

Flexible, thin coating silicone rubber, was used to replace the seals for the large cargo and passenger doors. Result: no sticking closed, no jamming open. Silicone coating makes a positive seal at all attitudes despite the wide variations in temperatures encountered.



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Silicone Fluids

Dow Corning CORPORATION
MIDLAND, MICHIGAN

TAPCO FM VIDEO TELEMETRY LINK



Airborne
Transmitter



Ground-based Receiver

TAPCO has FM video telemetry systems are built around an exclusive TAPCO circuit design. They utilize a unique system of signal synthesis which combines the advantages of wide-deviation FM modulation with the high-frequency stability of crystal-controlled equipment. The airborne transmitter is of compact modular design, allowing a wide choice of module components, and simplifies problem of system integration.

APPLICATIONS

TAPCO video telemetry systems are ideal for applications requiring extremely stable picture transmission and reception. Operations over distances from one to 500 miles is not unusual. These systems are now ready for application to manned aircraft, drones, missiles, satellites, balloons,

space stations, and tanks, trucks, and bulldozers operated remotely in nuclear or other hazardous environments.

PERFORMANCE

Voice Band Width: Up to 10 megacycles
Frequency Stability: Transmitter-0.01%
Receivers-0.001%
Power Output: From 1 to 30 watts
Output Frequency: 100-500 megacycles.

COMPLETE SYSTEMS

TAPCO can provide complete or partial telemetry systems, including transmitters, receivers, antennas, and the video camera and terminal equipment. Considerable system flexibility is allowed by the wide range of component choices.

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BUSINESS AND MANUFACTURERS FOR THE AIRCRAFT, MISSILE AND SPACE, RADAR, ELECTRONIC AND NUCLEAR INDUSTRIES

during basic investigation of magnetic breakdowns of liquids and gases in the loop that these techniques can be harnessed to generate electricity. A plasma generator would have an moving parts, producing electrons directly from conversion of electrical energy to plasma in the field. Power could be produced by a nuclear reactor. Such station could produce large amounts of power at a favorable input to weight ratio and be able to withstand long-term.

Considerable additional research and knowledge is needed before plasma generators become an operating reality. WADD's plasma team estimate that this might require another decade.

Meanwhile, WADD is evaluating proposals from half a dozen companies for plasma generator study programs and hopes to award one or more contracts soon.

Wright Air Development Division also is negotiating a contract for research and development of a plasma energy source based on electrons. Last year, RADC thereon named an Air Force contractor for feasibility investigation of a transmission kilowatts powered by microwave energy heated up from the sun.

Moreover, energy was to be converted to heat, a comparatively inefficient conversion process. WADD now seeks techniques for direct conversion of electrons.

FILTER CENTER

* **Fast Switching Tunnel Diodes**: Rca Corp. of America will demonstrate four types of tunnel diodes, two of which are capable of fractional-micron-second voltage drops, at this week's Western Electronic Show and Convention (WECON). One of these, generation 10, has claimed switching times as low as 1 nanosecond, a figure intermediate between 0.2 and 1 nanosecond.

The generation 10 diodes have typical peak-to-valley times of 11.1, voltage swings of 10 mV to 1 V, and gain 3, 20 and 50 ms, respectively. Voltage swing for silicon diodes varies in 100 ns to 1.7 μs. All diodes are capable of operation over -85 to 190°C. High switching speeds are made possible according to RCA by an electron-stripping process which reduces the junction to one mill and junction capacitance to less than 10 picofarads. The diodes are in production and available from Rca Semiconductor and Micro Diode Division, Somerville, N.J.

* **Designing Low-Nose Systems**: Topcon Inc.'s a 34-page booklet containing a series of articles written by engineers of Arribalzaga Instruments Laboratories on the topics of low noise, noise and parametric amplifiers, noise, be-

distributed to engineers at their week's Western Electronics Show and Convention (WECON). Most of the articles are reprints from professional journals but others were written expressly for this booklet. Readers interested in obtaining the booklet free of charge should write to 111 Eberhard, Arribalzaga Instruments Laboratories, Dept. Park, Glendale, Calif. and Telstar.

► **Wideband Surveillance Instruments**: Learfield Research Corp. acquired one-third interest in SGS (Società Générale Sistemi Spazio), Milan, Italy, a manufacturer of germanium ultra-wideband microwave transistors, silicon diodes, gold



He's Spotting Premature Removals

Cracks, finer than hairlines, sometimes form around spark plug inserts. Most of them are invisible to the naked eye at overhaul. But cracks grow as the cylinder ages in service. And a cracked cylinder means a field change knocking the stuffing out of your operating hour cost.

This cylinder has been heated in caustic soda, neutralized in nitric acid. Any cracks present—even the finest—stand out as the black lines. The Airwork inspector now examines the area around each spark plug insert carefully . . . using a 20-power binocular microscope. He makes sure this cylinder will run through the entire operating life cycle without failure.

He is saving you money . . . applying one more Airwork test to make sure that the engine you get will deliver maximum, trouble-free service life. This is only one more reason why, in the long run, you always save money with an Airwork Overhaul. For complete details, call your nearest branch.

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Weight for Development. This is Under WADD contract. Webbed Instruments is developing a web-based indicator in which pilot data will be leveraged to be displayed, connecting indicators to appropriate similar and varying corresponding tools into two further WADD programs with Cleo and Cleo-Plus. The indicators use three interlocking evaluation instruments, one out of which can be selected by user for viewing through option assessment.

Pile Features at Wadsworth-Nea
Cage Pad, Inc., of Wadsworth-Nea
Co. will add two mobile source control
pads which will automatically monitor
and indicate when a dose that should
be indicated is approached. The idea is to
monitor an workplace environment or
other such damaged situations
throughout the plant. Systems developed
in Teletronics Systems Systems,
Inc. and TBW, will monitor 1,730
potential trouble-spots. Recovery areas
will be detected by the mobile unit
via a flashing light in one of a series
of well house lights located throughout
the building and a bell obtains extraction
motor control panel contact closure
and a partial, full plug, plugged into the box.
Computer reads from sensors which
will be used to prevent something of
dangerous.

- Signed on The Demand Line—Major contract awards recently announced by some manufacturers include:
 - Dynamics Corp. of America, 51 rail cars an ammonia train from Bellco Radio for long range solar tracking system to be used in next Project Mirren space capsule at distances out to 700 miles. Railcars will be set up in Bechtolsheim, Grand Canyon Islands, Amakiriwa Islands, Mexico and Japan.
 - Sherritt Corp., Takoradi, Ghana, to supply 100,000 Btu/hour control heat from the Mamfe Co. for desalination plant to enable start-up of mineral leaching of Titan Industries' manganese oxide sandbar sites at Vingerberg Hill.
 - Federal Bell Electronics Corp., Los Angeles, contract to manufacture ST identification circuitry for local equipment for West German Company, will also supply engineering personnel to perform validation at West Ger-

* **Firefield Camera & Instrument** Corp., 52.5 million spent for development of advanced photogrammetric photo mapping system from Remote Air Development Center Sverdlovsk will allow aerial photograph and provide topographical charts of most refined precision.

* International Resistance Corp., 517 million contract to develop and test high reliability metal fiber sensors for use in Magnephone ballistic missile guidance system. Contract is from North American Aviation.

High-temperature motor requirements?



New Airborne
HM420 Type is
operational to 600°F



General Engineering Data — Kortenaer
HM-400 Type High Temperature Meter

Radar Voltage and Frequency: 115,000
volts DC. 4000 rpm. 4000 rpm. 4000 rpm.
Lidar: 20 cm. Wavelength 6 - 6000 nm, power
300 mW, 15 - 100°F.
Astrocam: Baseline 1.25-1300 nm.
Scanning Lidar: Wavelength 8 nm. Beam
dwell times 250-500 ns.
Microwave Radar: 10,000 GHz.
Heated Wind: 0-200.
Cloud Optics: 1 molar, size 1.0 micrometer.
Velocity: 1, 20, 100 m/sec.

particularly where weight and bulk are critical factors. Write or phone any of our offices. New Product Bulletin PS-5A is available on request.

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foreman
on the longest
road in
the universe



Revolutionary new "pathway" concept lets the operator "drive down the street" to anywhere—promises major civilian benefits

Six years ago, recognizing that development of advanced vehicles was outrunning man's ability to control them, the Military assigned Douglas the job of doing something basic about simplifying instruments.

This project evolved into ANIP (Army-Navy Instrumentation Program) with Douglas coordinating the efforts of a highly-specialized industry team.

Result has been a remarkable control panel design—a closed highway down which the operator drives his aircraft, spaceplane, submarine, tank or ship with perfect confidence, even when visibility is zero. Also provided is a topographical map which gives him visual current information on his position and the reach of his fuel supply.

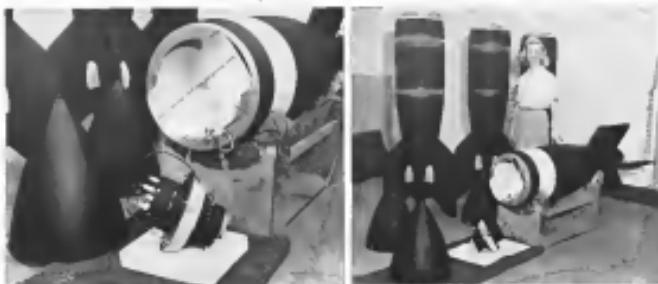
Civilian application of this new concept could well extend to ships, submersibles and even trucks and cars which will drive themselves down this "electronic road."

ANIP is another demonstration of how Douglas imaginative thinking and practical know-how lead the way in today's technology.

DOUGLAS

MISSILE AND SPACE SYSTEMS •
MILITARY AIRCRAFT • CIVIL AIRCRAFT •
TRANSPORT AIRCRAFT • AERONAUTICS •
FIGHTING SUPPORT EQUIPMENT

EQUIPMENT



ELECTRONIC tow target system and reflector of tow target are shown above. Up to four tow targets can be fired from tail bogies.

Infrared Tow Target Scores Near Misses

Artillery targets are target equipment of automatically, semiautomatic and manual operation, now under evaluation at the Air Force's Target Development Laboratory, Eglin AFB, Fla. The targets incorporate radar corner reflectors and flares to detect both radar and infrared seeking missiles.

The electronic scoring system, developed by the Target Development Laboratory at Eglin with the assistance of Radiation Inc., McMenamin, Fla., detects war zones within either 15 or 30° radii. These engagement "tell" times, depending on missile profile. The scoring system is used to permit score through determination of using accuracy as well as the missile guidance system.

Plastic Flies

The TDU-6/B target is towed 90° to avoid radar behind the tow aircraft. The 50 lb. target is constructed from porous fiber board with four plane stabilizers fore. The center effector, mounted in the center of the target, provides an assault size radar cross-section for interception by radar seeking missiles. Flares, mounted in the tail of the target provide a heat source for infrared homing missiles.

Controlled signals to guide the flares are transmitted by the intercepting aircraft.

Automatic Steering

Scenes for the automatic steering testbed consists of a study oval circuit measured in the tail section of the target. Changes in altitude regulation

is effected by collectors from a passing missile during the scenario, operating at 1,600 cps, to produce a signal across an orthode valve. Angle fed by an audio amplifier, the signal is rectified and used to trigger a monostable multivibrator, which operates a motor for 5 sec. The relay applies power to an AM 1600 cps, 1.5 watt transmitter.

The relay also operates a temporary antenna disengagement relay which trans-

mits the antenna and the fiber for firing receiver to a transmitter. The resulting base signal is transmitted to ground stations and to the intercepting aircraft flying the tow aircraft mission to indicate a zone within the preset radii of 15 or 30 ft. The fire firing receiver operates at all times except when a scoring signal is present. The received signal (pulse modulated at 1,020 cps) operates a charging relay to fire one, two or four flares.



SENSOR for automatic steering is mounted in tail section, as an aid for infrared homing.

SAFETY

CAB Accident Investigation Report:

Dynamite Caused National DC-6B Crash

At approximately 2055 EST on Dec. 6, 1968, a National Airlines Douglas DC-9 crashed as it held approximately 14 km northeast of the town of Napa, California. All 48 passengers and the crew of four were killed. (AVW Jan. 11 p. 34.)

281 I need to review 30 lbs flight 1751 that record the following changes from 1800Z clearance advisory on 121 [redacted]

National pres from 2000Z VNC clear 180 to the 040° 01000' crosswind via 18000' due to heavy icing at VNC area. Due to no refu-

Flight 2110 of Jan. 16, 1986, departed New York International (JFK) Airport at 2144 as an IFR clearance scheduled at 2154. The flight was cleared direct to the intended runway in accordance with an IFR plan shortly after passing Waltham, N.Y.

When radar contact was lost at 2154, the aircraft was known to be en route at 10,000 ft. The clearance was issued at 2154 for Flight 2110 to descend to 9,000 ft. The flight then continued. Flights 46-47 and 171-180 were cleared for takeoff after Flight 2110. Flight 2110 completed descent

Vicksburg time zone. West of 10 and minutes from descent started, no visual could also become at 10 thousand feet. The clearance was issued at 2154 for Flight 2110 to descend to 9,000 ft. The flight then continued. Flights 46-47 and 171-180 were cleared for takeoff after Flight 2110. Flight 2110 completed descent

182215Z 1806 R - Releasing Andrus information of 0102 and Estesbury information at the next reporting point.

Radar Contacts

Using the flight track file provided by the National Weather Service, the radar contacts were plotted. The contacts are plotted in Figure 1.

At 0211 Flight 2161 contacted the controller and was cleared direct to Wilkes-Barre/Scranton at 10,000 ft and then maintained a route, progress report. Shortly after the controller cleared the air traffic control (ATC) center, the pilot called a "squawk change" and was given a new squawk. Following this exchange the air traffic control issued a six digit descending right turn and cleared it in the northeast of Bolivia at 0214. The controller then cleared the aircraft flight path.

No influence is made in this report concerning the placing of the dynamic streamer or the location of the point of connection to the seafloor.

Background Alescott

Flight 2511 at Jan 5, 1958, was one of two aircraft used as replacements for Flight 601 which was scheduled as a nonstop Boeing 707 at flight to Chicago (Midwest) at

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from the State of California under
the California Water Bond.

from Manas, the flight was re-submitted to AFM at 2215. During the command inspection on N 704PA it was discovered that the cockpit door aft sealation was cracked and would require replacement. Since it was estimated that the replacement time would be about 5 hrs, a National Lockheed Electra, N 2081K, and a National Douglas DC-85, N 821SE were selected.

Passport Amend

Passenger originally seated on flight 608 was replaced on a domestic flight several hours on the Elstree and then the DC-3. Security staff passenger boarded the Elstree, which departed New York International Airport at 2114. The remaining 29 passengers boarded the DC-50 which left the terminal at 2134. The flight plan filed by Capt. Smithson requested permission to land at night en route to Cork 511R. C. Law-

July 19, 1968, at 10:00 a.m. at the University of Wisconsin, Milwaukee, Wis., and V. L. Larson in Milwaukee, Wis., reporting an altitude of 35,000 ft.

10,000 ft. which run the required eight miles around.

Flight 2011 proceeded in a westerly manner in successive, with an eight plus and clearway and reported to Wilmington Center over the Wilmington, N.C., VOR at 0227 15000 ft extending Andes into another at 0400 and Gateway structure at the next reporting point.

Entity Contracts

During the flight from Edgewood to ad-
dress the communication contacts with
AAA during Flight 2111 maintained con-
tact with National Weather Service radio-
station located at Edgewood, Washington,
and, Wilmington. It is the practice of
the company to have its pilots make these per-
forming research in NMIC.

At 0311 flight 249 established contact with the approach radar at Wilmington on 128.3 mhz. At this time the flight was located at



affairs of working, and our body were found near Kest Beach. It was said at Blyton



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⁸ See Brink's *describes* Bois's material out-of-pairwise he relativizes.

With Mr. A. S. Campbell, Sales Manager, Bata Aircraft Corporation, El Cajon, California

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First Space Vehicle Recovered From Orbit

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USAF DISCOVERER/AGENA SATELLITE RETURNS TO EARTH AFTER 1/2 MILLION MILE TRIP

When man enters space, his survival will depend upon how well scientists have been able to anticipate the human and mechanical factors involved in space flight. The U.S. Air Force's recent successful DISCOVERER Program Agena Satellite flight has made an important contribution in this area. Information gained from instrumentation in this first successful recovery of the Agena's re-entry capsule is now being analyzed. It will provide the U.S. with vital facts applicable to designing vehicles for manned space flight and successfully recovering them.

General Electric's Missile and Space Vehicle Department, in Philadelphia, Pa., designed, developed and built DISCOVERER Program re-entry/recovery vehicle which housed the vital instrumentation package. MSVTD has also developed and built the animal life support system which will be carried in the recoverable capsule on future Discoverer/Agena satellite flights.

Working as a subcontractor to Lockheed's Missile and Space Division, Discoverer Program systems manager and prime contractor,

MSVTD was able to utilize its years of re-entry/recovery vehicle experience to help make that satellite recovery and recovery possible.

MSVTD



DISCOVERER/AGENA WAS LAUNCHED FROM CALIFORNIA and orbited Earth numerous times at altitudes from 161 to 436 miles before its re-entry vehicle was ejected and returned to Earth near Brazil.



USAF 69046-TEST WING (SATELLITE) RECOVERY SQUADRON C-119FS followed radio signals from G-II developed satellite Discreetee recovery module until it was visually sighted. A helicopter from the U.S. Navy Vought made the recovery about 300 miles northwest of Roncador.



1 RE-ENTRY/RECOVERY VEHICLE AND FAIRING ARE MATED TO AGENA SATELLITE AND THROU^GH INTEGRATION AT YARDLEY AIR FORCE BASE IN CALIF.



2 APPROXIMATELY 82 MILES ABOVE EARTH, THREE booster separates and Lockheed Agena's integral engine starts to give satellite final thrust into orbit.



3 ONCE IN ORBIT OVER THE POLES OF EARTH, Lockheed Agena is kept stabilized through its 12 Earth orbits by internal control systems.



4 G-II RE-ENTRY VEHICLE IS EJECTED from nose of Discoverer/Agena at a rate which lessens reentry stress. In orbit, lifting 60 degrees toward-Earth.



5 ORBIT-EJECTION rate-equals an end-of-re-entry vehicle has enough propellant to descend into the atmosphere and conduct ejection. After reaching the re-entry vehicle from orbit, the ejection seat is separated.



6 IN THE EARTH'S ATMOSPHERE, after reentry, the vehicle's heat protection shield falls away, parachute opens at 30,000 feet for slow descent. Radio beacon, landing lights are activated.

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was over London at 0210, 18,000 ft, and descended WSW of Paris at 0216, with Andor at 0217 in the north cockpit. At this time the Midwayites reported continued the flight that the MiG-19s had been shot down.

At 0231 Flight 2311 reported its trajectory was 0217° at 18,000 ft, descending at 0227° at 18,000 ft, continuing Andor at 0232° with Clodover at the west cockpit. The flight reported that at the time of the radio contact they were over the Caudron Bank east between the 10° E latitude which was 100 miles (a distance of 1.66 deg.), that the flight had been en route to Gafred (YUG), then it went out of the clouds and was now en route for the first time. The compass radio operator noted the time of the transmission of the message to 0211. This was the last contact with Network Flight 2311.

At approximately 0230, a telephone call was received by the National Airlines office operator from a Robert Headley of Atlanta, N. C., advising that there was an airplane wreckage located in the area his home 11 mi. northwest of Atlanta.

This wreckage was later identified as that of the Andor site.

An approximate examination of the main wreckage area showed that the major portion of the aircraft was severed near the rear of the fuselage in New York, N. C. In addition, reports were received of wreckage being located at Kroc Beach, approximately 35 mi. east of the Atlanta site.

It was apparent from the initial examination at the scene that a sudden and violent explosion had occurred at the rear of the aircraft immediately prior to impact. It was evident that a three-dimensional destruction of the fuselage and control wing wreckage was necessary to fully explain the aircraft destruction pattern. The wreckage, therefore, was moved to a site in the Woods, Atlanta, Ga., where it was checked and verified. The aircraft was reconstructed, and what corresponded to the contour and size of a DC-48 fuselage.

All of the wreckage found at Kroc Beach was found to be from the fuselage and rear section of the aircraft. There were two pieces of the fuselage tail section from the right side just off the location and two sections of interior hatch structure, from the same area. Also found at the Kroc Beach site were two pieces of the left wing structure which attached to the fuselage directly below. The longitudinal compartment area, a section of the right lateral of the hydraulic compartment, three of the four cabin oxygen bottles and one of the two cabin oxygen tanks found at Kroc Beach, reflected the pattern of roadway damage patterns of Phoenix from urban warfare; pieces and embankments were dug out near the right side of a lateral span of the right fuselage door and aft of port.

Examination of the aircraft wreckage and surviving documents indicated that no significant disintegration of the aircraft had occurred, which supported it as part in the fuselage near the leading edge of the right wing, as the right side of the passenger cabin. The position of wreckage recovered in the Woods Beach area was from all those found at Kroc Beach.

After the fuselage wreckage was purchased

THE GRAND CENTRAL REPORT

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 - 4.** Storage requirements have been exceeded in all cases.* A few more facts: Recco H₂O₂ is a stable liquid over a wide range of temperatures. Its high density reduces space requirements per unit weight. Its ease of catalytic and thermal decomposition makes for simple and reliable systems.

While today for our theoretical performance chart and supporting data, as well as technical bulletins describing the propellant characteristics and availability of ethylmethane-H₂O₂. Address: Dept AW 2.

In the meadow at Westford was found what appears to be 99% of the *Batrachomoeus* of class I and II here recovered and identified. Most of the winged pupae of the *Batrachomoeus* appear quite low on irregular edges of the leaf litter, a cluster is above and extending far down. By leading edge, of the wings are for right side of the heading. Numerous small fragments of upper *Batrachomoeus* shell recoverable from the leaf litter, not so many as those of *B. fuscus*, nor *B. nebulosus*, and about one-half of them still were preserved there being somewhat broken and crushed when found.

The finishing, floating was achieved intact except for a strong area extending approximately 50 cm ahead from the right side of the fuselage and extending forward from station 400 about 14 m. This strong area of fuselage remained the floating between stations Nos. 4 and No. 5. The signs of

The floating adjacent to the missing area was irregular and extensively deformed. Five separate pieces of floating from this area were recovered from the main wreckage area. All of the float carpeting between the main seats was recovered except for a portion corresponding to the missing floating area. This portion was located at the right end, toward the front of the boat.

All of the wavy reefs was cut and sawn at successive planes and ages. X-ray examination was found to contain numerous large fragments which included pieces of GCT in some reefs, and relatively broken carbon materials similar to that used in the manufacture of an adobe-type flight bag. Marginal shale deposits were also found on the dipping

Cable Connections

Eight heavy electrical cables are installed in three conductors which connect the eight negative lines in the hydroelectric equipment to the main positive line at the rectifier and which pass through the area of the commutating portion of the field cage and adjacent to the commutating portion of the rotor. These cables were recently damaged and had no previous apprehension and care was taken and the conductors were found to be separated in several

All of the surface furnishings off the interior, and the headrest, were examined for insect deposits, and found to be free of any insect condition.

The upholster was placed on the ant pit board of the song stool as it appeared in the final point of the firelog damage test. Numerous two-pore sponges approximately .25 in. diameter and worked down at each end were found scattered throughout the upholster. Deposits of calcium carbonate, sodium sulfate, and complex mixtures of sodium salts were found in the air vent in the backrest section from the right side of the stool in the area of the heat focus of the initial deterioration.

One of the eight men which were in

calized in its right side of the parapet wall and which was removed at the main deck. The exhibited damage, which was described as different from that observed in the first inspection, was not due to the explosion and had occurred before, and locking of its structure. Also, the steel was intact at both ends, and lighting of the structure and there were no signs of any damage to the steel. The cause of the damage was not determined. The cause of the explosion was not determined, but it was believed that the explosion resulted from the external source to the existing position showing a localized appearance. Some of his last welding residual material and not intense heat was used. The cause of the fire and anomaly was not determined, but it was believed that it originated with a hydrogen leak which was identified at a previous date.

Other Reasons

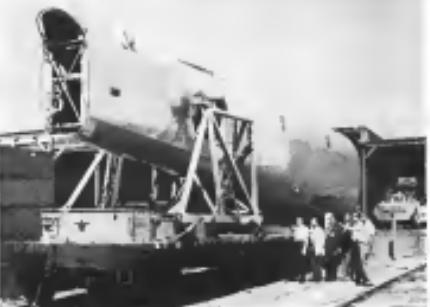
studied with a block reference which
ended at a nuptial dome.
Nine articles and portions of the base
of anterior beakings from the tree
rat collected and submitted for laboratory
examination for evidence of explosive
resets or foreign object damage and tissue
as partially or wholly social pathologic
processes. The remaining articles were
placed in the anterior beakings of the
male in the tree remaining his initial
mate. Both were subjected to laboratory
examination.

Wien-District

Two other designs, as usually observed in many rock bolted and lagged hydraulic compartment arms, have been mentioned at this time as having a failure or malfunction which could be considered as causal factors of this accident.

On Bush's escape from these two ports, all but one of the structures recovered from this compartment was located in the main deck hatch. There was no evidence of fire, or vapor

—
—



Temco Delivers First B-52H Assembly

Fair all heading section of the new Boeing B-52H jet-powered bombers, built by Long Beach, Calif., division of the Boeing Co., will be mounted at the Wichita, Kan., facility of Boeing Airplane Co., which is assembling the airplanes. First B-52H is scheduled to leave the production line at Wichita in October and delivery to Strategic Air Command will begin early next year.



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5. **CHANCE VUGHT F-101 CRUSADER**—Three RMC-Lindsay pressure gauges are flush-mounted in the outside skin of the F101-1 for quick accessible ground checking of pneumatic systems.
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ports were granular or solid and were of mouse-sized like material. Attached to the larger pieces was a portion of a woman's hat band 3 to 4 cm. in size.

5. Metal particles were also found in the chest lining, and a number of fibers were found in the liner of the face.

Black crusty sounds granular material. The density of the particle increased on the finding of less brittle bone fragments which were identified as less brittle bone broken such as the rib cage bones. A fragment of bone 200 mm long was found in the chest cavity of the patient. This bone was extremely brittle, it had a slight odor, and the bone particles were extremely brittle, the bone attached to the bone fragment were pieces of sheer dark cloth a heavy plate similar to the front door rotisserie plate of a Windstar. "There's" were black, and suggestiveness of bone material.

Steel Wire

The two fragments recovered from the body of Mr. Frost were determined to be 815 w diameter low-carbon steel wire. Each wire particle was broken, twisted at both ends. Some wire particles were bent and twisted. The length of each of the eight tiny wires found. Similar wire particles were also found embedded in the floor covering.

A small piece of brass was recovered from the left kidney just below the elbow. This piece, approximately 6 mm thick, 1 cm wide, and 1 cm at least at the other.

A leather belt found at Kins Beach was found to have copper mesh interwoven in it, and was punctured by fragments of flesh colored rubber and blue rubber fibers made to simulate mimicking the human-type belt found.

Black deposits on the leather belt were found to contain carbon residues.

Black crusty particles recovered from the right hand were found to be iron-gum, fibrous, a substance found in dry cell batteries.

Manganese dioxide was also found on the underside of one of the right finger tips and on various parts of the fingers.

The examination of the initial wreckage disclosed no evidence of any malfunction of either of the aircraft's engines, propellers, or any other part of the aircraft in the dimension of damage to the passenger cabin.

The review of the accident records and the maintenance and overload records showed that no work was properly accomplished and adequately supervised.

Human Factors

The finding of the body of one of the passengers some 16 m from the main wreckage site, where all the other bodies were recovered, was considered significant in that it clearly showed that the type of takeoff flight had occurred only after the ingestion of cocaine. The examination of the findings in other detail indicated that the passenger who caused the cabin wall failure remained alive until the termination of his life. Dr. Frank's body showed that the injuries sustained were severe enough to cause death, and that the cause was attributed to the effects of the toxic agent associated with an aircraft accident.

The existence of an explosive force in close proximity to this passenger is indicated by the aviation expert noted, the transonic

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interpretation of the lower extension, and the fragmentation of metallic tissue transferred to form a longitudinal direction and less of a transverse. And the position of bone seems to render direction to the main bone shaft of the finger of the right hand. In addition, the numerous parcels of metal, fiber cloth, wire, and other objects found in the body tissue could only have resulted from the detonation of an explosive in close proximity to the patient.

Medical experts at CAAI evaluate exposure with heretofore "load area" injuries and other injuries resulting from explosion as evidence that the injuries sustained by the health board at Kauai County Wealthy could only have been caused by an explosion.

Analysis of the evidence reveals greater pressure at the time of the accident clearly indicate that another was not a factor in that accident.

The winds shift reading at the time of the accident were 10 knots or stronger, 300 ft above the water, with gusts up to 100 mph and up to 15° between 10,000 and 12,000 ft. clearly explain why many small light pieces of the aircraft cabin wall were found loose. These parts defined our conclusion as to the cause of the initial explosion and fuel tank damage. This was supported by the subsequent finding of a number of these missing parts which had worked up along the beach.

A lengthy and detailed study of the wreckage was conducted to determine the cause of the initial explosion. The possibility of an unexploded projectile was considered. These included a large piece of the cabin structure believed to be explosive decommissioned, a paracenter blade holder, followed by cabin penetration and explosive decommissioning, the possibilities of the cabin structure being a structural failure before explosive puncturing, a lightning strike after explosion, gas tank explosion, and the possibility of the detonation of an explosive substance within the aircraft.

The analysis of the initial damage, the severity of the forces involved and the location from which the force emanated, together with the check of the aircraft structure and its systems, eliminate the possibility of a field piece explosion.

The extreme force of the impact causing the aircraft to break in two, the wreckage recovered evidence which in effect eliminated all of these possibilities except for the possibility of the detonation of an explosive substance within the aircraft.

The extreme force of the impact causing the aircraft to break in two, the wreckage recovered evidence which in effect eliminated all of these possibilities except for the possibility of the detonation of an explosive substance within the aircraft.

The destruction of the main cabin structure was attributed to the first impact of the structural failure also indicates that a high explosive was the cause of the accident.

The sodium carbonate, sodium nitrite, and complex mixture of sodium-based compounds found in the ice crust of the debris were identified as explosive material found after the detonation of dynamite.

The presence of nitrate bases on a lighter found in the Kauai County area also substantiates the fact that an explosive substance may set off in the passenger cabin. Management details it is currently being

Folded Wings

Navy pilots flew a Convair Vought F9U Crusader jet fighter from the Naval Air Facility at Naples, Italy, closest to 1,000 ft. and maximum slant for 24 sec before making a smooth landing with 6.7 rad of each wing tip folded to vertical position.

After discussing his problem, the pilot told the 36th's maintenance crew, dimpled his fuel and landed. During the flight he kept the 4,000 mph-plus fighter at an implied 100 ft. lt.

Sixty wing tips on the Crusader is 35 ft. X 3. The wing tips are folded by power over a system of bracing and struts designed to assist control.

The aircraft's location of about 100 miles from Naples, Italy, is 100 miles from Sicily, 340 miles from Rome and the incident had occurred 11,744 ft. in three overcast clouds.

The aircraft crashed near Patti and Messina, Italy, on Aug. 12, 1960, in solid fog and 805 ft. in heavy rain, overflying the town of Messina, Italy, at 10,000 ft. and the aircraft had exploded. 11,744 ft. in three overcast clouds.

The aircraft was flying on the Ikarus 600 and the presence of the aircraft went through the explosion of the aircraft. The aircraft was flying on the Ikarus 600 and the presence of the aircraft went through the explosion of the aircraft.

The aircraft was flying on the Ikarus 600 and the presence of the aircraft went through the explosion of the aircraft.

It is the Board's conclusion that Flight 2511 proceeded in a normal manner without significant difficulty, mechanical failure, or engine trouble until shortly after passing the Grotto Roads "Wing" feature a short distance south of Wimberly, N.C.

At approximately 18,500 ft., a dramatic change was exhibited, indicated by means of a dry ice bath, which the passenger values and the presence of the aircraft went through the explosion of the aircraft.

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The Gulf Aerospace Board was notified of this accident Jan. 6, 1960, by the Federal Aviation Agency and an investigation was immediately started by an investigator with the authority of 10,000 ft. of the Federal Aviation Agency. An investigation was initiated by the Board and was completed on January 22, 1960, at Washington, D.C.

The Canine

National Airlines is a Florida corporation and maintains its principal office in Miami, Fla. The company holds a current Certificate of Public Convenience and Necessity for scheduled and nonscheduled passenger and cargo services and cargo operating certificates for those operations.

The Aircraft

N 62281 is a Douglas DC-6B aircraft, manufacturer's number 43742, having a gross weight of 30,000 lb. and a maximum takeoff weight of 34,000 lb. and the aircraft had accumulated 11,734.13 hr. in these hours.

The aircraft crashed near Patti and Messina, Italy, on Aug. 12, 1960, in solid fog and 805 ft. in heavy rain, overflying the town of Messina, Italy, at 10,000 ft. and the aircraft had exploded. 11,734.13 hr. in these hours.

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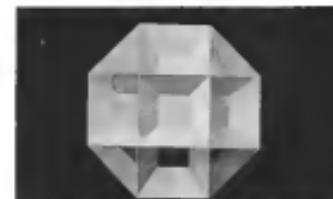
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SPACE TECHNOLOGY



ANISOTROPIC passive communication satellite configurations under study by Russia to provide lighter, more compact and denser than simple planar patch checkerboard pattern with diamond-shaped reflector surfaces each collecting light in short and long range models.

Cloud of Needles Studied for Global Relay

Washington—Cloud of tiny needles in orbit at an altitude of 3,000 mi which would function as a huge reflecting umbrella for radio signals, a major communication link in the Air Force's new AirCom (480-L) global communications network.

This was discussed here at the recent Global Communications Symposium at a meeting presented by E. W. Kefler of International Communications Systems, Inc., which is associate prime contractor to the AT&T system program.

The technique of using a cloud of hot, fragile needles or whisk as a flying surface is being developed by Massachusetts Institute of Technology (AW Aug 1, p 211). The needles would be small enough and sufficiently fragile to pass no hazard to space vehicles or satellites passing through the cloud. This can be designed to affect with a relatively narrow band of frequencies, being translatable to all other frequencies.

Handle-Cloud

The dead of winter placed us in a high-altitude orbit by undescended high rope could provide communication coverage for the bulk of the Forts bases scattered around the globe if orbit altitude was 3,000 mi or higher.

Misleading intent and effect, in the communications satellite field both for military and commercial use was pointed up here by the sizable number of reports presented on the subject and the large turnout of engineers and scientists to hear the reports. For instance

* International Telephone & Telegraph Corp. reported results of its studies which indicate that a commercial global network of active communications satellites, capable of per-

adding 500 voice channels, could be implemented and operated for 10 years at a cost of about \$150 million, including regular replacement of switches during the 10 year period. The PTT authority corresponds closely with a recent estimate by American Telephone & Telegraph Corp. (AWW July 16 p 373), which estimated cost of a similar system

These various issues converged to include the following:

Area At Development Center area and that new techniques in communications, higher power transmitters, more geographic communication vehicles as well as other types for uniform applications. Although in actual measurement and application there is the advantage of being able to cover a large percentage of the earth's surface. Because of the problems, to some extent, in low power transmission and reception in land and sea areas, the development of mobile and satellite communications is the most important development in the field of mobile and satellite communications. Because, therefore, operating frequencies or radio can be changed on the ground, and less vulnerable to damage, according to Donald Worth.

It is to be headquartered. The selected land configuration may only resemble those of artificial values, but should reflect appropriate uses more basic to earth, according to Christopher B. Melrose, an authority in environmental planning, who, with colleagues, designed an area of 45 acres in which the attorney on any part of the

+ Ross Armstrong (Ca' s Missing G) Chidambaram described a search of amniotic liquor stability configurations during investigation by Ross which could measure the strength of the signal reflected off a given surface and also control the direction of the reflected signal to improve the probe.

as a passive transmission media. These will be a concrete glass

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PROBLEMATICAL RECREATIONS 28

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—Markomene Magazine



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ARRIVED TO LATE WITH PROBLEM? Since the minute hand moves 60 minutes around a clock while the hour hand moves 5 minute spaces, the minute hand moves one space while the hour hand moves 1/12 of a space. If we equal the number of minutes past three when the hands will be coincident, a simple linear equation in our unknowns will give x equal 16 and 4/11 minutes past 3 o'clock. Similarly, the hands of the clock will be coincident at 27 and 3/11 minutes past 5 o'clock. Thus, the man started at 6 and 4/11 minutes past 3 and walked for 2 hours and 10 and 10/11 minutes.

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gal reflected, raising energy to be concentrated on a plane metacolic surface, reflected in the front surface of the sphere and retransmitted in a parallel beam, either in the original direction from which the signal arrived or at a predetermined angle by adjustment of the plane metacolic surface.

* **Isodesatellites**, an irregular polyhedron configuration consisting of 18 square faces and eight triangular faces. Each face can be introduced with oblique with an angle of 135 degrees which would fractionate incident light a corner reflector to reflect incident energy back in its original direction. At a frequency of 3 kHz, satellite of this configuration measuring about 100 ft in diameter, would provide directivity at 32 dB. The front face could be used for short range communications, while the eight adjacent faces and oblique with reflect energy at angles of 45° to 135° deg, utilizing them for wide angle, or long distance communications.

* **Multisatellites**, consisting of a spherical array of several helices mounted on a smooth sphere which serves as a ground plane. The helices could be connected individually or in groups, by signals carried from the earth, to achieve desired waveforms and/or directions of reflection.

The most economic approach is a communication satellite system intended to provide global commercial services in as complex active (project) satellites as a minimum operational cost (\$2,500 mi.), ITT's Louis Pollock reported in Globe-Con.

The ITT studies indicate that such satellites probably will operate in the 3.7-4.2 deg E/F 95.4 km. band and will use transistors with outputs of about 5 watts. The satellite itself probably will measure about 7 ft in diameter, 1.5 ft long, with total weight of about 450 lb. The first flight ITT has anticipated will be in 1973. The solar arrays will be 180 sq ft, with auxiliary transistors, antennas and solar cells at 270 lb; for the propulsive system required to keep the satellite in a synchronous (geostationary) position, Pollock said.

The satellite will employ decisions systems with 24 kg. memory and be earth stabilized to minimize satellite transmitter power requirements. The acoustic and transmitter power would be all solid-state except for a traveling wave tube in the transmitter, Pollock said.

General status will employ 60 ft probability surfaces. Large status, located in areas requiring high channel capacity would employ 1,000 dBW transmitter while smaller stations would have 100 dBW transmission. Full link extended each of the high-capacity stations would cost about \$1 million while the medium-size cost would be around \$400,000 each.

BUSINESS FLYING



TWIN ENGINE version of Beech Baracuda, designated Super-V, makes a turn over San Francisco's Golden Gate Bridge.

Aviation Week Pilot Report:

Super-V Has Good Engine-Out Stability

By Russell Hawes

OAKLAND, Calif.—Twin-engine conversion of the Beech Baracuda called the Super-V is designed to a relatively low cost way for business fliers from to business helicopter operators.

By Aviation Week, Inmarsat, Oakwood Aerospace, manufacturer of the conversion kit, believes a market for its range is 1,000 units.

The Super-V is certified as a new National Cargair airplane (NAC) July 12 (p. 15). Older models of the Baracuda are most frequently converted for conversion because their lower maximum seat load down the tail cost of the Super-V.

Price of the standard conversion is \$25,000, and the basic price of the Super-V is \$34,000. The total price to the customer for the total price will be just under \$54,000.

The Aviation Week pilot found

important points of difference and may caution on the handling characteristics of the Super-V and the single-engine Beech.

The Baracuda's V-tail provides adequate directional stability and control with one engine out. In the most critical condition—maximum controllable speed of 150 mph with full takeoff power on the operating engine and the center of gravity near its forward limit—rudder forces needed to keep the plane from swinging into the dead engine are some what higher than those of light twins with conventional tails but the rudders have ample power to maintain heading.

Major differences between the standard Beech and the Super-V are the same reduced seat load and the lack of a center console. The Super-V needs no problem common to V-tail design. Rudder as does not make it oscillate at best slightly in yaw.

According to Edwin H. Gough, president and chief pilot of Beech Aviation, greater longitudinal stability is provided by the greater distance between the two engines, which are farther from the center of gravity than is the basic single engine airplane and therefore have a longer lever to influence the stability of the airplane.

When the airplane was tested deliberately and left to stabilize itself with hands off the controls, it took about 40 cycles for the stick-slip oscillation to damp out. With the wings held level it needed only about five cycles. The period of the stick-swinging oscillation was about 3 sec.

The Super-V uses the standard Beech frame for the same reduced seat load linkage for steering. The cockpit floor is flat and is not blocked by the low-mounted engine. The cockpit layout is changed little from that of the Baracuda except for the addition of

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Aero Commander 560F

SAFER

The 560F features a service ceiling of 21,500 feet—single engine, 10,300 feet. Stall speed goes and flap down is 66 mph. Short field takeoff/run only 1,670 feet—sea level rate of climb is 1,730 fpm! The 360-horsepower normal dual—will spin 3,500 r/min with a 30-second reserve.

FASTER

New spinning 10D-340 FUEL INJECTION engine delivers 339 hp! Added power and SPEEDLINE design increase the top speed to a fast 230 mph—true, 214 mph! Yet the new gross weight is 7,000 lbs.—3,450 lbs. of useful load!

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Propellers dynamically balanced on the engine, new log-log engine mounts and a raised thrust line combine to produce a new smoothness in flight! Now the legend for visibility: Aero Commander provides even smoother flying comfort!

QUIETER

A new outside wing offers improved cabin quietness in the center and increases it up and aft of the cabin. This feature plus new sound insulation reduces the cabin whoo-whoos! There's now interior luxury, too, in the elegant blending of rich fabrics and genuine leather in your choice of color combinations.

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AVIATION WEEK, August 22, 1988

the engine, enclosed fuelcell, dual-ring engine instruments and a modular tab switch under the left panel. Gough is not satisfied with the cockpit and airplains will be delivered with a new directional trim control now being designed. A gang bar enables the pilot to turn off all electrical system switches in one movement. Another gang bar can be used to switch off the magnetic coil of both engines at once.

Super-V Powerplants

The two Lycoming O-363 A1A engines provide ample power. For a climb strong enough to allow good visibility over the trees, Gough advises the use of a trim tab which, after taking off, reduces the low chord speed of the elevator path to a minimum.

Cruise climb is at 120 mph and best

The Lycomings are rated at 180 hp for takeoff and limited in the Super-V to 170 hp for longer cruise life. Since the single engine of an A35 Bonanza is rated at 185 hp, the Super-V has power to spare. The modification only costs nearly \$10,000 to 185 hp in 1/324 lb.

Maximum gross weight is increased from 2,650 lbs. to 3,160 lbs., as with the center of gravity at the forward limit of 3,233 lbs.

Levering is working on a fuel injection version of the O-363 powerplant which the Super-V series plans to use. The Super-V also has the 10D-340 as recommended by FAA. The fuel-injection engine will have a better silhouette and would allow the Super-V to use a nacelle only 16 in. deep. The revised thickness of the private nacelle is about 22 in.

Super V NS490A, used in the evaluation, has a large elliptical vent centrally located, but Gough said Rock Aviation has decided to remove it or relocate it since it is up and aft of the cabin. That feature plus new sound insulation reduces the cabin whoo-whoos! There's now interior luxury, too, in the elegant blending of rich fabrics and genuine leather in your choice of color combinations.

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At 5,800 ft., the Super-V was improved for cruise and achieved 175 mph with a true airspeed of 196 mph with a power setting of 24 in. kg. and 2,400 rpm. At 9,100 ft., the airplane will cruise at 200 mph, with the center of gravity at .45, or 281 mph with a power setting of 24 in. kg. and 2,400 rpm. The Super V will carry a full load of fuel (100 gal.), four passengers and 198 lbs. of luggage in a range of 1,250 mi. The rated single engine rate of climb at 185 mph is reduced to 140 fpm. It can maintain an altitude

of more than 9,000 ft. with one engine.

The Super-V is hard to stall and gives ample warning, resulting in a tame-type stall warning selector. The indicator activates a red light, but there is no horn. If the airplane is held in a power-on stall with tabs down and gear down, it tends to break to the left rather straight, but early use of opposite rudder can keep the plane straight until the stall and rudder forces lessen.

The stall occurs at 67 mph.

Attempts to hold it in the stall long enough to blank out the stabilizer on the side of the stabilizer wing failed. The V-tail apparently places the surface high enough to avoid stalling and the characteristic sharp pitch-down could not be induced. A "close" spring had placed in the elevator system to improve longitudinal stability makes the airplane tend to nose down and recover in steep approaches and drops below the stall point. With power off and the wing clean, the Super V would do little to hold it in the stall and it appeared possible to hold it in a stall indefinitely using rudder to prevent a spin.

Tire Tab

The Super V should be flown with maximum tire pressure. The change in trim and flight is negligible, but the trim is quite sensitive to changes in speed and power. Maximum rudder load force can run as high as 120 lb. with an engine out at constant control speed and with the remaining engine at full power. Elbowed forces can go up to 19 lb., but lateral forces force control 12 lb.

The large rudder-deflection deflection with one engine out increases stall speed because of the additional drag. With the right engine out, stall speed goes up to about 73 mph 16% and with the left engine out it is about 75 mph. True airspeed in the T-38 is 140 mph. Gough says that flight tests showed the Super V to have good nose-down spin characteristics. This could not be observed on the evaluation flight because the airplane is plumbed against autorotation.

The Super V looks like the original Bonanza. Final approach is at 95 mph and touchdown is at 75 mph. One first landing was a little fast, but there was no serious tendency to float.

The original twin-engine Bonanza conversion was made by David Peacock of Tulsa, Okla. (AW Aug. 27, 1986, p. 30). Rock Aviation Services, then doing business as Outback Aviations, bought the program and the rights to the conversion from Peacock in 1988. Since then it has done a considerable amount of additional engineering.

Gough estimates that the total in-



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continent in the program will approach \$1 million by the end of the year. Investment on this scale is made easier by the fact that Bell Aviation Services is a wholly owned subsidiary of the Lawrence Investment Corp., of San Francisco and is a sizable tenant in its own right.

Gough estimates the baseline prior for the Super-V program at 300 units. This is a rather large volume by the standards of earlier conversions, but the thousands of Bantams used in various roles prior to World War II and the Korean Conflict, Models 15, A35, B15 and C35, have been submitted for conversion to date, but requiring a long drawn out later module through F15. The new Bantams coming off the Beechcraft line are designated S33. Gough believes just one would be the single engine airplane will become a logical candidate for conversion at decommission entry into its market value or as the financial circumstances of the owner improve enough to make the purchase and safety of the twin engine airplane affordable.

To get design data on ultimate loads, for the engineering of the Super-V, Bell Aviation Services Model 15 Beechcraft was destroyed. Aerodynamic investigations showed that flutter would develop as early Bantam trials at a little

over 300 mph. The better performance of the converted aircraft narrowed the margin between this speed and the aircraft's normal operating speeds, so Bell Aviation measured the damping by striking counterbalance arms at the root ends of the rudder pedals, backed up their fore/aft ends and released the trim tab lever. The rates exceed rates on the original substrate at 240 mph, compared with the 205 mph for the single engine model.

The aft fuselage section is strengthened by reinforcing the rear fuselage and adding more strength. The fuselage is also strengthened in the cabin area above the wing carry-through structure. The wing tip webs are hooked up and the leading edge outward of the engines are made with 30-gal acetate fuel tanks with the filter cap at the top. The weight of the engine and the fuel in the leading edge tanks can be had upon the tip by distributing some of the engine's weight outward of the wing root. Engine oil cooler inlet are in the leading edge.

The engine air intakes at the fan and end of the fuselage leading gear supports on the structure leading back to the rudder. Diagonal bracing extending from the aft end of the fuselage and inboard to the next rib transmits some of the loads out into the wing. The inboard end of the forward spar web is reinforced by a stainless steel plate. The leading gear/canoe rib is not stiffened except for strips of acrylic skin stretching along the outside of the upper and lower skin, substantially adding strength to the rudder cap. Glass fiber weights, originally designed for the Beechcraft by Lestec, also double as VHF and UHF antenna enclosures.

The glass fiber canopy shells are attached directly to the canopy and never with them to the Dynelized chord members. The shells are not attached to the aft stability shell as a rigid extension of the wing structure. Bell Aviation expects the fuselage to shear into the coal cracking common to light twins. The fuselage nose section is also made of glass fiber, including the transom, tailcone, Luerian frame, and the electrical system battery box. The nose section holds radio racks and a 15,000-watt combustion heater and is used as space for luggage.

As well as making up to five aircraft and a month, Bell Aviation Services' Super-V kit is for distribution located in Madison, Wis., Buffalo, N.Y., Charlotte, N.C., and Hope, Ark. To get a distributorship, a company must agree to buy 12 kits within two years.

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Involves detailed engineering design, design integration, development and life testing, and preparation of associated documentation or hardware items of the types listed above.

Engineers and Scientists: If you are experienced in work related to any of the above areas, you are invited to write: Research and Development Staff, Dept. H-17B, 962 W. El Camino Real, Sunnyvale, California. U.S. citizenship or equivalent Department of Defense industrial security clearance required.

It is not only where it is expensive, more boat and truck transportation is considerably cheaper. The Bell, too, is based on VTR on the one hand and limited VTR on incentive rates since it has no dining room. The planes are double volunteer as communications systems, so that instructions for surface transportation to port are to take off and make from the air.

Finally, Paulsen says, he hopes to expand the operation to the point where it will drive the revenue rate of 10% up to the level of the average family budget, rather than the heavy class it still is. By using his aircraft fleet in cargo carriers, tenders and porters, Paulsen figures an up-charge of 1,000,000 lb. or so this year.

PRIVATE LINES

Dedication of Ft. Worth's new helipad port, far remote by car from the center of the city, was scheduled for last week with an audience featuring military and civil helicopters.

Once indicator, now in production by Non-Tech Inc., Manhattan Beach, Calif., is an all-transistorized unit, weighing 12 lb. and priced at \$195. It is self-contained requiring no additional power supply and can be operated in conjunction with any standard VHF receiver.

Rents of \$5 million in volume will be reported by the Distribution Division of Southwest Airlines Corp., Dallas, Tex., for its total new orders May 11, an increase of some \$2 million over the same period last year. Much of the interest is credited to airline passengers for their air jet flights and emphasis on marketing parts and options to fixed base operators by the division's Dallas, Houston, St. Louis, Kansas City and Denver offices. Southwest will close a two-year option of approximately \$12 million for the business aircraft service company.

New hangar to serve business aircraft at San Francisco International Airport has been completed by Bee Aviation Services Co., formerly Oakdale Aircraft. Hangar can handle all sizes of aircraft up to 40,000 sq ft. Charles Brazil has been appointed service superintendent.

First Sikorsky S-61 turboshaft-powered helicopter produced for the off-shore industry has been delivered to Petroleum Helicopters, Inc., of Lubbock, Tex. Aircraft cost \$247,000 and can carry 11 passengers to rigs in the Gulf of Mexico.



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In broad terms, helitronics embraces practically every phase of avionics, electronics, computer, feedback and systems analysis work. Specifically, helitronics means the integration of communication systems, specialized electronic sensor and detection equipment to enhance the mission capability of the helicopter; specialized sensors and automatic controls to maximize its versatility, and automatic navigation, into an optimum military weapon system or commercial carrier with VTOL capability. Many assignments exist for the ability to advance the state-of-the-art in testing and instrumentation.

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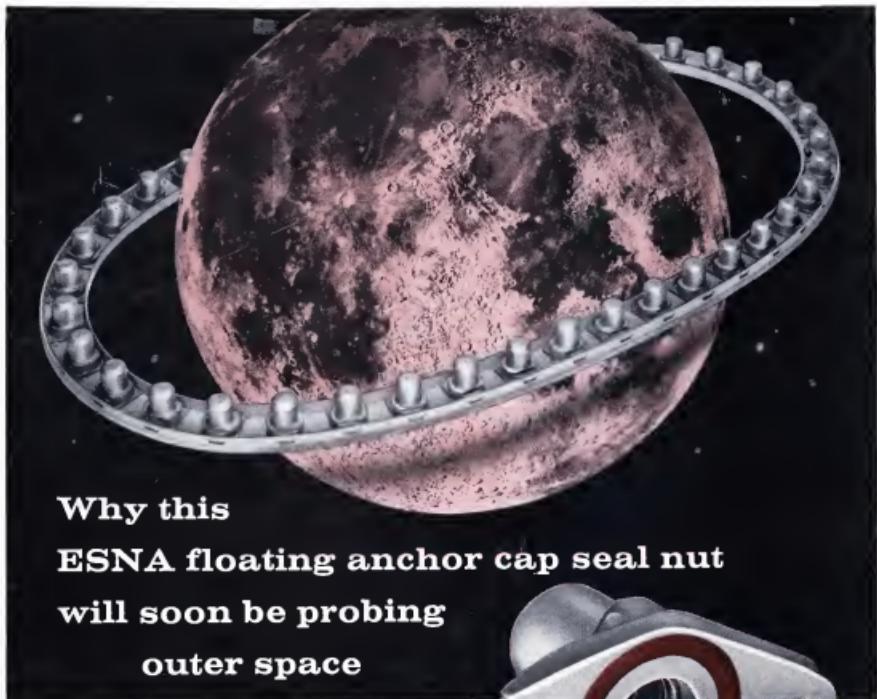
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Type A4040 is a self-locking anchor nut with a special "O"-ring in the base that provides an hermetic seal to prevent loss of air pressure through seepage along the bolt threads. The stop nut held captive inside the dome provides .020 inch minimum radial floating action to allow quick bolt installation in spite of slight misalignment of bolt holes. It is 100% seal tested before shipment. The seal is effective whether the bolt is installed or not, and is not destroyed by repeated bolt installations. It will withstand vibration and temperature variations from -70° F. to 400° F.

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Let us send you complete details on the wide variety of cap nuts specifically designed for internal fuel tank fastenings to prevent seepage of volatile fuels: two lug (A2502) and its miniaturized equivalent A2506; one lug (A2507) and straight gang channel strips (G2500). Consider too, the access door design opportunities provided by a football-shaped ring of cap seal nuts such as the one illustrated above and which is performing outstandingly in the integral fuel tanks of one of the nation's newest jet liners.

Write . . . Dept. S54-825, Elastic Stop Nut Corporation, 2330 Vauxhall Road, Union, New Jersey.



Type A4040



A2502



Miniature A2506



A2507



G2500



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